Grand Canyon

National Park Service
U.S. Department of the Interior

Grand Canyon National Park

Environmental Assessment/Assessment of Effect

March 2003

North Rim Campground Rehabilitation & Water Distribution System Improvements

Grand Canyon National Park • Arizona

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Summary

Grand Canyon National Park proposes to rehabilitate the North Rim campground including actions such as resurfacing roads, removing the existing fee collection kiosk and replacing it with a larger fee collection station near the existing parking area, rehabilitating existing restrooms, and constructing new restrooms in the group site. Grand Canyon National Park also proposes to improve the North Rim water distribution system, including the establishment of a fire protection system by replacing undersized and leaking antiquated piping, adding or replacing fire hydrants where necessary, upgrading a pressure booster (pumping) station, and connecting existing reclaimed water piping hydraulically to the potable water system. The campground proposal is needed to address poor road conditions, a registration kiosk that is too small and does not meet current needs, vehicle stacking in front of the camper store and vehicle exit from the campground, and inadequate restroom facilities. The water distribution system proposal is needed to address inadequacies in delivery volume and pressure throughout the potable water distribution system, leaking pipes and an inadequate number of fire hydrants.

This Environmental Assessment evaluates three alternatives for addressing the purpose and need for action, including a no action alternative and two action alternatives. Both action alternatives include upgrading the existing water distribution system through replacement of existing piping, use of the existing reclaimed pipeline for potable water for the fire protection system, installation of a new pumping station, replacement of some fire hydrants and the addition of some new fire hydrants. Both alternatives also include repaving roads within the campground, rehabilitating five existing campsites into universally accessible campsites, campground restroom and walkway rehabilitation, and construction of one comfort station and one vault toilet at the group site. The primary difference between the action alternatives is the way in which the campground entry is addressed. Alternative B also includes reconfiguration of the campground entrance to include construction of a new entrance and exit, removal of the existing campground kiosk and replacement with a new drive-up fee collection kiosk, and construction of four new tent campsite spurs. Alternative C includes the removal of the existing campground kiosk and the construction of a new walk-up registration building adjacent to the existing parking area, while maintaining the current campground entrance configuration.

Neither action alternative would have measurable impacts to air quality, soundscape, floodplains and wetlands, environmental justice, prime and unique farmland, or the socioeconomic environment. Both action alternatives would result in negligible to minor adverse impacts to soils and water, minor adverse impacts to general wildlife populations, negligible to minor adverse impacts to special status species, and minor to moderate impacts to visitor experience and park operations that would be beneficial in the long-term, but adverse in the short-term during construction. Both action alternatives would result in minor to moderate beneficial impacts to historic structures with improvements in the fire protection system and campground restroom facilities. Alternative B would result in the loss of integrity of the historic campground entrance road, while Alternative C preserves this historic configuration. Alternative B would result in the removal of approximately 41 – 58 trees while Alternative C would result in the removal of approximately 14 – 28 trees.

Public Comment

This environmental assessment will be on public review for 30 days. If you wish to comment on the environmental assessment, you may mail comments to the name and address below, no later than **April 30, 2003**. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Please Address Comments to:
Joseph F. Alston, Superintendent
Attention: Sara White, Compliance Officer
Grand Canyon National Park
P.O. Box 129
1 Village Loop
Grand Canyon, Arizona 86023

Contents Page

List of Tables Page

List of Figures Page

Chapter 1 – Project Scope

INTRODUCTION

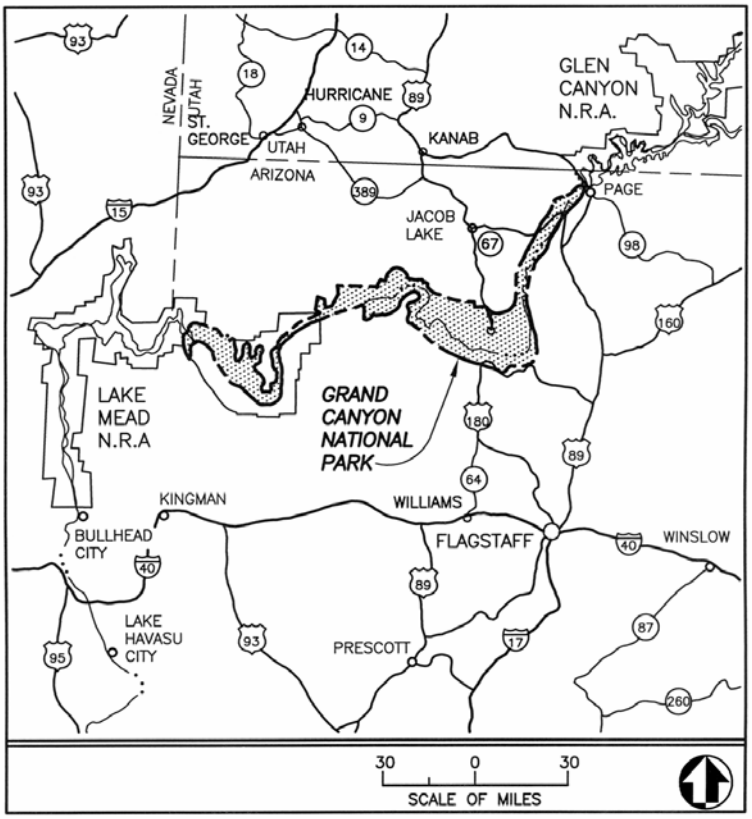
The purpose of this document is to disclose the expected effects to the human environment of various components of the proposed rehabilitation of the North Rim Campground and the proposed improvements in the North Rim water distribution system. The human environment is defined as the natural and physical environment and the relationship of people with that environment. The North Rim Campground and the existing water distribution system are located on the North Rim district of Grand Canyon National Park, in Coconino County**,** Arizona (Figure 1). The proposal for the campground includes resurfacing roads, removal of the existing fee collection kiosk and construction of a larger fee collection station near the existing parking area, and rehabilitation of three restrooms and construction of two new restrooms in the group camping site. The proposal for the water distribution system consists of establishing a fire protection system by replacing undersized antiquated piping, by adding or replacing fire hydrants where necessary, by upgrading a pressure booster (pumping) station for increased flows, and by connecting existing reclaimed water piping hydraulically to the potable water system. Piping that is too shallow and subject to freezing would be replaced. The campground portion of the proposal would result in less than 1 acre of new ground disturbance and the water distribution system portion of the proposal would result in replacement of approximately 2.75 miles of water line, which equates to approximately 2.5 acres of new ground disturbance for the necessary trenching. These projects are located within the Bright Angel watershed.

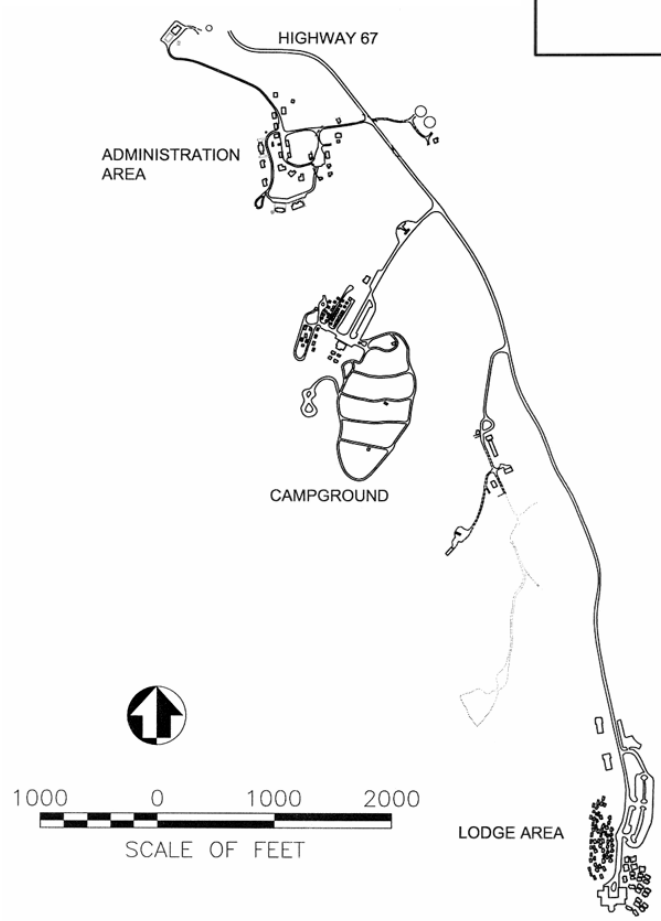
PURPOSE OF AND NEED FOR ACTION

The purpose of the campground proposal is to address needed repairs and current inadequacies of the campground facility including the following actions: resurface the roads within the campground, remove the existing fee collection kiosk from its existing location and construct a larger fee collection station adjacent to the campground parking area, rehabilitate the three existing restrooms within the main campground, and construct two new restrooms at the group site. This campground rehabilitation proposal is needed to address the following management concerns:

- Campground roads are severely deteriorated, causing soil erosion and compaction problems.
- Vehicles sometimes stack up at the existing campground entry and conflict with vehicle access to the nearby camper store.
- The existing road entry configuration does not adequately accommodate vehicle exit from the campground
- The existing small fee collection kiosk is inadequate for the employees who work in it and the registration system is poorly accommodated.
- Restrooms within the campground are inadequate. They do not meet current accessibility standards, they do not shed snow and water effectively, and walkways and paths near the restrooms do not meet accessibility standards. Two of the three restrooms were built in the 1960's and are in need of repairs and upgrading. The third is an historic log structure that needs minor repairs to log ends and replacement of the metal roof with a corrugated cor-ten metal roof.
- The two existing chemical toilets within the group site are inadequate for the level of visitor use this area receives and do not currently provide adequate service during the winter for wintertime visitor use.

Figure 1. Grand Canyon National Park Project Vicinity





NORTH RIM DEVELOPED AREA

GRAND CANYON NATIONAL PARK

The purpose of the proposal to upgrade the water distribution system is to address inadequacies in water pressure and volume, causing concern regarding fire protection capability and domestic water flow. The following actions are proposed: A fire protection system would be established by replacing undersized antiquated piping, adding or replacing fire hydrants where necessary, upgrading a pressure booster (pumping) station for increased flows, and by connecting existing reclaimed water piping hydraulically to the potable water system. Piping that is too shallow and subject to freezing would be replaced. The water distribution system rehabilitation proposal is needed to address the following management concerns:

- Fire protection is inadequate with respect to delivery volume throughout the potable water distribution system. Most of the piping is very old and subject to unacceptable leakage.
- Fire protection is inadequate with respect to delivery volume and pressure capabilities through about one-half of the reclaimed water system because the existing booster pump system is too small and is not automated. Reclaimed water storage for fire protection is unreliable because the tank cannot be filled in winter and volume is much less than potable water storage.
- Although a reclaimed water system exists, there are currently no real uses for reclaimed water on the North Rim. The fire sprinkler system at the Lodge is connected, but a fire sprinkler system does not typically involve consumption of water. Connection of this system to the potable water system with the other proposed improvements would address inadequacies of fire protection and domestic flow. However, should uses for reclaimed water be developed and should improved reclaimed water storage and pressure boosting systems be installed, the existing reclaimed piping could be easily reconnected to the reclaimed water source in the future.
- Piping in several administrative and residential areas occupied during the shoulder (spring and fall) seasons is too shallow and subject to freezing.
- Some areas have an insufficient number of fire hydrants. Some existing hydrants are antiquated or undersized.
- The existing potable water booster pumping system is not adequately sized to meet fire protection needs in all areas.

Objectives of the Action

1. Provide adequate fire protection and domestic water flows to North Rim developed areas.
2. Improve the quality of the visitor experience at the campground by facilitating visitor check-in, minimizing conflicts with the camper store, and improving the work environment for employees at the fee collection station.
3. Rehabilitate restroom facilities to more effectively shed water and snow, and bring restrooms and associated paths and walks up to current accessibility standards, while recognizing the existing architectural merit of each building proposed for rehabilitation.
4. Replace inadequate chemical toilets at the group campsite with permanent facilities to accommodate visitors during summer, winter and shoulder seasons.
5. Alleviate soil erosion and compaction problems in the campground by improving the quality of the roads.
6. Minimize new ground disturbance and tree removal.

MANAGEMENT AND PLANNING HISTORY

National Park Service Management Policies (2001) is the guiding document for management of all national parks within the national park system. It is the basic Service-wide policy document of the National Park Service that supercedes the 1988 edition. It is the highest of three levels of guidance documents in the NPS Directives System. As stated in the introduction, "It (NPS Directives System) is designed to provide NPS management and staff with clear and continuously updated information on NPS policy and required and/or recommended actions, as well as any other information that will help them manage parks and programs effectively." Among direction on all aspects of park management, these Management Policies set forth direction for each unit of the national park system to maintain an up-to-date General Management Plan. Chapter 9–Park Facilities is applicable to this project.

Grand Canyon National Park is currently operating under the direction of the *1995 General Management Plan* (GMP). This plan provides guidance for resource management, visitor use, and general development for a period of 10 to 15 years. The primary purpose of the Plan is to provide a foundation from which to protect park resources while providing for meaningful visitor experiences. The North Rim campground and the location of the water distribution system is part of a development zone, which prescribes the area to provide and maintain facilities for serving park managers and visitors. A summary of the GMP as it applies to this project is provided in Appendix A. The North Rim campground is specifically mentioned in the 1995 GMP:

> Page 46: "Campground will be redesigned and revegetated to protect resources and to provide additional privacy. The number of group sites and the locations of individual sites will be studied and the number of campsites may be reduced slightly. The maximum length for vehicles in the campground will be 22 feet. The existing laundry and shower building will be replaced by a larger facility in the campground."

The GMP also makes reference to the water distribution system:

> Page 48: "The North Rim water supply system will have adequate capacity to handle increased demands for potable water inside the park."

An interdisciplinary team discussed potential issues with the campground entrance, roads and opportunities for addressing the purpose and need for management action within the campground during a Value Analysis Study in October 1999. In October 2000 an interdisciplinary team met during a Value Analysis to discuss the parkwide restroom rehabilitation project, which included a discussion of the North Rim Campground restrooms. In January 2001 an interdisciplinary team met during a Value Analysis to discuss the North Rim water distribution system and evaluate water system improvement options. A value analysis is a systematic approach of evaluating alternatives in context with the value of identified issues, concerns, and functions. The use of value analysis and the subsequent choosing by advantages protocol when evaluating the merits of large projects is a National Park Service mandate. Preliminary scoping to identify concerns of additional Park Service specialists with the proposals occurred in December 1999. A week-long meeting with NPS staff and the Arizona State Historic Preservation Office (SHPO) was held in August 2000 to discuss this and other North Rim project proposals. The proposals were reviewed by the park's standing interdisciplinary team in March and April 2002. The campground entrance portion of the proposal was revisited by park management and team members during a site visit in August 2002 and the proposal was subsequently revised. An internal review of the draft Environmental Assessment was conducted in November – December 2002.

A public scoping letter, which included several North Rim projects including the campground rehabilitation and water distribution system improvements proposals was submitted to a 300-person Grand Canyon National Park mailing list on November 29, 2000. A public scoping letter that described the parkwide restroom rehabilitation proposal, including the North Rim campground and group site, was submitted to this same park mailing list on December 8, 2000. These letters were also posted on the park's website. The purpose of the scoping letters was to describe the proposed actions to any interested/affected parties and solicit comments from those who may have issues with the proposed action(s). The north rim projects public scoping was a topic of discussion at the monthly GMP community meeting held at the park on January 11, 2001. A notification and short article on north rim project proposals was published in the Williams/Grand Canyon newspaper, in the January 3-9, 2001 edition.

NPS staff met with personnel from USFWS and AGFD on December 13, 2000 to discuss this project proposal and other future proposals. NPS staff met with USFWS several times between March and June 2002 to discuss this project proposal in conjunction with a batch consultation for several construction projects, including the North Rim campground rehabilitation and water distribution system improvements, throughout the Park. Concurrence on the batch consultation was received from USFWS on 9 July 2002 and indicated that the projects may affect but are not likely to adversely affect the Mexican spotted owl and the California condor. Consultation with USFWS regarding a small portion of the water distribution system near the water tanks is ongoing, but consultation is complete for the remainder of the proposed work included in this EA. In addition to the August 2000 discussions with SHPO, the campground rehabilitation proposals were discussed with SHPO at a meeting on October 16, 2002 and February 20, 2003.

The proposed actions analyzed in this EA and their potential cumulative effects have been discussed at several Grand Canyon National Park Interdisciplinary Team (IDT) meetings. Project specifics and cumulative impact discussions were discussed at IDT meetings on August 20, 2002, September 10, 2002, and November 12, 2002. Discussions with the IDT were held in part to determine the level of analysis needed, cumulative impact methodology and adequacy of cumulative impact information.

This EA incorporates by reference and tiers to the *General Management Plan Environmental Impact Statement* (July 1995).

ISSUES AND IMPACT TOPICS

Various agencies have been contacted and consulted as part of this environmental analysis. Appropriate federal, state, and local agencies have been contacted for input and review (see Chapter 5 for a list of persons contacted). National Park Service specialists, with input from federal, state, and local agencies identified issues and concerns (i.e. impact topics) affecting this project. After public scoping, issues and concerns were distilled into distinct impact topics to facilitate the analysis of environmental consequences, which allows for a standardized comparison between alternatives based on the most relevant information.

An issue is an effect on a physical, biological, social, or economic resource. The predicted effects of an activity create the issue. Issues may come from the public, from within an agency or department, or from another agency (Freeman and Jenson 1998). For this project, the interdisciplinary team identified issues with various proposed alternatives. Although a few responses to the scoping letter were received from the public, no additional significant issues came forward through public scoping or scoping with other agencies. Once issues were identified,

they were used to help formulate alternatives and mitigation measures. Impact topics were then selected for detailed analysis based on substantive issues, environmental statutes, regulations, executive orders, and *NPS Management Policies* (2001). A summary of some of these compliance-related laws and regulations is provided in Appendix B. A summary of the impact topics and rationale for selection/dismissal are given below.

Relevant Impact Topics

Soils and Water - Proposed activities would result in new ground disturbance and have the potential to impact the soil and water resource. This topic will be discussed in Chapter 3.

Vegetation - Proposed construction and trenching would involve disturbance of vegetative communities in a small area and some tree removal would be necessary. There is the potential to increase disturbance to adjacent biotic communities via the spread of exotic vegetation and noxious weeds. This topic will be discussed in Chapter 3.

Wildlife and Special Status Species – Proposed activities would involve some disturbance to vegetative communities and thus disturbance of wildlife habitat. Habitat modification as well as noise and other activities associated with project implementation have the potential to impact wildlife populations. In response to a request for a list of federally listed species in the project area, the U.S. Fish and Wildlife Service (USFWS) in a letter dated December 14, 2000, (USFWS Reference #2-21-92-I-204), provided a list of threatened, endangered and proposed species that have the potential to occur in Coconino County. The Arizona Game and Fish Department provided a list of special status species in a letter dated January 24, 2000. Representatives from both agencies also met to discuss this and other Park projects in December 2000, and also discussed multiple North Rim proposed projects during the preparation of the Parkwide Construction Program Batch Biological Assessment during March – June 2002 (NPS 2002). The information provided was used to develop a list of species of concern for this project. Impacts to these species and general wildlife populations are discussed in Chapter 3. Section 7 of the Endangered Species Act requires all federal agencies to consult with the U.S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. Chapter 3 will also include determinations of potential effects of project implementation on federally listed species.

Cultural Resources – The 1966 National Historic Preservation Act, as amended, NEPA, the 1916 NPS Organic Act, the 2001 NPS Management Policies and other NPS guidelines require consideration of impacts on cultural resources. Project undertakings have the potential to affect archaeological resources, sites of special ethnographic significance to American Indians, buildings and structures contributing to the National Register significance of the North Rim Inn and Campground Historic District, the Grand Lodge National Landmark District and the North Rim Headquarters Historic District, as well as other elements that contribute to the historic cultural landscape at the North Rim. Therefore, this topic will be discussed in Chapter 3.

Park Operations – Park operations such as maintenance of buildings, roads and grounds would be affected to some degree by the action alternatives. This topic will be discussed in Chapter 3.

Visitor Experience – The 1916 NPS Organic Act and the 2001 NPS Management Policies direct national parks to provide for public enjoyment. The North Rim provides a low-key atmosphere where visitors can enjoy the serene environment and sweeping canyon views in a relaxed, uncrowded setting. Visitors could be affected by construction traffic, increased noise, and disruptions in traffic flow. Therefore, this topic will be analyzed in this document. This topic will be discussed in Chapter 3.

Impact Topics Dismissed from Further Analysis

Air Quality - Clean, clear air is essential to preserve the resources in Grand Canyon National Park, as well as for visitors to appreciate those resources. Grand Canyon National Park is a federally mandated Class I area under the Clean Air Act. As such, air in the Park receives the most stringent protection against increases in air pollution and in further degradation of air quality related values. The Act then sets a further goal of natural visibility conditions, free of human-caused haze. Air quality in the Park is generally quite good. Pollution levels monitored in the Park fall below the levels established by the Environmental Protection Agency to protect human health and welfare. However, the ability to see through the air (visibility) is usually well below natural levels because of air pollution. Most of this pollution originates far outside the Park's boundaries, and arrives in the Park as a well-mixed regional haze, rather than as distinct plumes.

Section 118 of the Clean Air Act requires all federal facilities to comply with existing federal, state, and local air pollution control laws and regulations. The park's air quality specialist has determined that this project, due to its limited scope, would not require consultation with the State of Arizona regarding air quality. However, because there is some ground disturbance involved, there is a possibility of raising fugitive dust during project implementation or from disturbed areas afterwards. After project completion, building and paving footprints would address dust there. Revegetation of disturbed areas if needed, after work is complete, would provide long-term dust control. Mulch and the plants themselves would stabilize the soil surface and reduce wind speed/shear against the ground surface.

Trenching and other minor on-site work would increase dust and combustion-related emissions. Dust raised during ground disturbance would be limited by the size of the project and the equipment used. By clearly marking boundaries of the project area, unnecessary soil disturbance, and consequent dust generation, would be avoided. Water sprinkling can control fugitive dust emissions from light traffic in the project area. Construction equipment itself can adversely affect air quality by exhaust emissions. Minimizing the extent to which construction equipment idles would help to reduce this effect. Minimizing idling would also help to reduce noise impacts during construction as well. The proposed project components occur within a development zone. Indirect air quality impacts from routine daily vehicle emissions from visitors, employees and official business would be unchanged.

Therefore, local air quality may be temporarily degraded by dust generated from construction activities under the action alternatives, and emissions from construction equipment. This degradation would result in an overall negligible impact to air quality, and would last only as long as renovation activities occurred. Impacts to overall park air quality or regional air quality are not expected. Likewise, impacts from foreseeable future projects in the area would be negligible and would be restricted to the period of construction. Slight beneficial impacts from implementation of any of the action alternatives would result from the reduction in vehicle queuing into the campground which would reduce vehicle idling and would therefore reduce vehicle emissions. Reductions would be dependent on the wait time and vehicle types

and would be difficult to quantify but are expected. Cumulative impacts would be local, short-term and negligible. Therefore, air quality was dismissed from further analysis.

Soundscape - The NPS is mandated by Director's Order 47 to articulate the Park Service's operational policies that would require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources. Natural sounds are intrinsic elements of the environment that are often associated with parks and park purposes. They are inherent components of "the scenery and the natural and historic objects and the wild life" protected by the NPS Organic Act. They are vital to the natural functioning of many parks and may provide valuable indicators of the health of various ecosystems. Intrusive sounds are of concern to the NPS because they sometimes impede the Service's ability to accomplish its mission.

Proposed project components would generate some construction-related noise in the development zone above ambient conditions. Noise sources include vehicles, power tools and equipment, and additional people in the area conducting the work. To protect the Park soundscape during project implementation, noise production must occur outside the curfew established for overflights, as listed in the mitigation measures developed for this project. Noise impacts from this project would only last the duration of the construction. After construction is completed, any noise level impacts would return to their natural condition. All construction would occur during daylight hours when roads and the associated traffic already affect the project area. Any additional traffic would only be temporary and would negligibly affect the areas in the short-term. Therefore, this project would have no measurable effects on soundscape. Similarly, the effects of past, present and foreseeable future actions on the soundscape would be short-term and would not measurably affect the soundscape. The potential effects of noise on visitor experience and special status species are addressed under those impact topics. Therefore, soundscape was dismissed from further analysis.

Floodplains and Wetlands - Executive Order 11988 (Floodplains) and Executive Order 11990 (Wetlands), which require federal agencies to examine the potential impacts of actions on floodplains and wetlands, were reviewed for applicability to this project. Because the project is not in or near a floodplain or wetland and would not affect this resource, floodplains and wetlands were dismissed from further analysis.

Environmental Justice – Executive Order 12898 requires consideration of impacts to minority and low-income populations to ensure that these populations do not receive a disproportionately high number of adverse or human health impacts. This issue was dismissed from further analysis for this project because each alternative would affect everyone equally and would not disproportionately impact minority or low-income populations.

Prime and Unique Farmland – The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in conversion of these lands to non-agricultural uses. Prime or unique farmland is defined as soil that particularly produces general crops as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables and nuts. This proposed project locations and surrounding lands have been evaluated by appropriate park technical area specialists and by specialists from the Natural Resources Conservation Service (NRCS). Based on their observations, the project area is not considered prime or unique

farmland (Camp, pers. comm. 2002). Therefore, this topic was dismissed from further analysis.

Socioeconomic Environment – Socioeconomic values consist of local and regional businesses and residents, the local and regional economy and park concessions. The local economy and most business of the communities surrounding the park are based on construction, recreation, transportation, tourist sales, services, and educational research; the regional economy is strongly influenced by tourist activity. The GMP EIS discussed the socioeconomic environment and impacts extensively. There may be short-term benefits to the local and regional economy resulting from construction-related expenditures and employment. Local and regional businesses would be negligibly affected in the long-term. Therefore, impacts, both adverse and beneficial, would be negligible and thus socioeconomic values were dismissed from further analysis.

ADDITIONAL NEPA ANALYSIS

The alternatives include all reasonably foreseeable connected actions. Environmental effects estimated for this project consider the site-specific effects of all foreseeable actions and mitigation measures. Monitoring during and following implementation of the project would occur to verify effectiveness of mitigation measures and predictions of impact. This EA will guide any subsequent project implementation. If new information or unforeseen and unanalyzed actions become necessary in the future, additional site-specific environmental analysis will be conducted before implementation.

Chapter 2 – Alternatives

INTRODUCTION

The NPS has adopted the concept of sustainable design as a guiding principle of facility planning and development. The objectives of sustainability are to design park facilities to minimize adverse effects on natural and cultural values, to reflect their environmental setting, and to maintain and encourage biodiversity; to construct and retrofit facilities using energy-efficient materials and building techniques; to operate and maintain facilities to promote their sustainability; and to illustrate and promote conservation principles and practices through sustainable design and ecologically sensitive use. Essentially, sustainability is living within the environment with the least impact on the environment. The action alternatives subscribe to and support the practice of sustainable planning, design, and human use of the North Rim developed area with its associated public and administrative facilities. While the proposal for the water system improvements includes disconnecting piping from the reclaimed water system, should uses for reclaimed water be developed in the future and should improved reclaimed water storage and pressure boosting systems be installed, the existing reclaimed piping could be easily reconnected to the reclaimed water source in the future. Grand Canyon National Park is committed to conserving water and would continue to explore future options for reclaimed water use on the North Rim as feasible and practical.

This document analyzes the No-Action Alternative and two action alternatives. Analysis of the No-Action Alternative is required under NEPA (40 CFR 1502.14(d)). It provides a baseline for assessing the potential impacts of the Proposed Action and the other action alternatives. In developing alternatives for this project some actions were considered and subsequently dismissed. A description of alternatives considered but dismissed from detailed study is included in this chapter. A summary table comparing alternative components is also presented at the end of this chapter.

The preferred alternative is based on preliminary designs and best information available at the time of this writing. Specific distances, areas, and layouts used to describe the alternative are only estimates and could change during final site design. If changes during final site design were not consistent with the intent and effects of the selected alternative, then additional compliance would be needed as appropriate.

ALTERNATIVE DEVELOPMENT

Several design alternatives were initially developed and evaluated to address the purpose and need for action for the campground entrance during a value analysis in October 1999, for certain components of the park-wide restroom rehabilitation project in a value analysis in October 2000 and for the water distribution system in a value analysis in January 2001. Alternatives were analyzed as a part of the Value Analysis exercise to weigh the merits of each preliminary alternative against the cost, using Choosing by Advantages protocol. Some of the initial preliminary alternatives regarding the design of the campground entrance and various water distribution system alternatives were dropped from further analysis, as described in the next section. Two action alternatives for the campground entrance and one action alternative for the water distribution system improvements were ultimately brought forward by NPS staff for

detailed analysis. These alternatives are described as components of both Alternatives B and C later in this Chapter.

The alternative that received the highest score during the Choosing by Advantages exercise for the campground entrance in October 1999 is identified as part of Alternative B in this document. The alternative that received the highest score during the Choosing by Advantages exercise for the water distribution system improvements in January 2001 is the only alternative carried forward for detailed analysis and is identified as a component of both Alternatives B and C below. The rehabilitation of the North Rim campground restrooms and the addition of restrooms at the group site was not included as part of the Choosing by Advantages exercise for the park-wide restroom project in October 2000, due to their limited scale and scope. The initial proposal is as described later in this Chapter as a component of both Alternatives B and C.

Subsequent discussions of the results of the Choosing by Advantages exercise for the campground entrance with park management and NPS staff resulted in the development of an additional alternative to address the purpose and need for action for the campground entrance. This alternative is described later in this Chapter as part of Alternative C and is the agency's preferred alternative.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED STUDY

Campground Entrance Configurations

Two other alternatives for addressing the purpose and need for the campground entrance reconfiguration were preliminarily identified during the October 1999 Value Analysis. The first alternative (identified as Alternative A in the Value Analysis) included reconfiguration of the existing campground parking for use as the campground drive-through entrance and exit. Two entry lanes and one exit lane would be constructed within the footprint of the existing parking area and a new drive-up fee collection station would be constructed. This alternative maximized the amount of space for vehicle queuing, minimized disturbance of new ground (all work would be within the existing parking area), but eliminated needed space for amphitheater parking and overflow parking. For this reason, this alternative was not considered further.

The second alternative (identified as Alternative B in the Value Analysis) included construction of two new entry lanes and one exit lane into the campground (similar in location to that described later in this document under Alternative B), with removal and relocation of tent camp sites disturbed by this new road, and construction of a new drive-up fee collection station. This alternative would allow for some vehicle queuing away from the camper store, would provide an easy exit from the campground, but would result in a loss of some parking spaces and the need to relocate campsites. For these reasons, this alternative was not considered further.

During preliminary discussions regarding a proposed new walk-up registration building, several other sites for this registration building were discussed, all of them within or adjacent to the existing parking area. Locating the building in an existing log restroom, now used for storage, was discussed but eliminated because the building is too small and poorly located to effectively function as visitor check in and registration. Locating the building adjacent to the parking area but closer to the existing kiosk was discussed but eliminated due to the fact that it would have less visibility to campground visitors as they enter the parking area. Locating the building adjacent to the parking area but more centrally located within the parking area was discussed but eliminated due to the need to remove more trees for building construction here and that it may be difficult to see as campground visitors enter the parking area. For these reasons, these alternatives were not considered further.

Water Distribution System Improvements

Two other alternatives for addressing the purpose and need for the improvements to the water distribution system were preliminarily identified during the January 2001 Value Analysis. The first alternative (identified as Alternative A in the Value Analysis) included a dual source with dual piping system. In this alternative, the system configuration would be identical to the existing system in that there would be two functioning systems; a potable water system and a reclaimed water system. New reclaimed water lines would be installed in the Lodge area, fire hydrants would be on the reclaimed system only and the majority of the potable water lines would be replaced to reduce leaking and allow winter operation. A pumping station would also be added to boost pressure. While this alternative would result in minimal ground disturbance and would implement and expand the reclaimed water system, it would also require maintenance of a reclaimed water reuse permit, would require the operation of dual pumping systems and would be more difficult to operate than other alternatives. For these reasons, this alternative was not considered further.

The second alternative evaluated during the January 2001 Value Analysis (identified as Alternative C in the Value Analysis) included a single source with single piping system. In this alternative, all potable water, fire hydrants and fire sprinklers would be on the potable water system. The majority of the potable water lines would be replaced to reduce water loss and allow winter operation. The new lines would be sized to meet the potable water and fire water demands. The existing reclaimed water system would be abandoned in place. A pumping station would be installed to boost pressure of the potable water system, for both fire and domestic water demands, to the upper two developments. While this alternative would be relatively easy to operate, it would be the least reliable of the systems evaluated because it would rely on a single piping system, would result in more disturbance in the developed areas to convert hydrants to the potable water system, and would preclude the use of the reclaimed water system in the future. For these reasons, this alternative was not considered further.

The alternatives selected for detailed analysis were those alternatives considered important to the decision being made and those that best represented the full range of possible environmental consequences, while still meeting the purpose and need for the action and the project objectives. Alternatives considered for detailed analysis are presented in the next section.

ALTERNATIVE DESCRIPTION

Alternatives are described below. Table 2 summarizes the primary components of each alternative and Table 3 summarizes the expected impacts from implementation of the alternatives.

Alternative A – No Action. This alternative does not meet the purpose and need for the project, but provides a basis for comparison with the action alternatives. Alternative A would maintain the existing conditions at the North Rim (Figure 2). A developed zone for the North Rim has been identified in the 1995 GMP and is used to guide management actions. This developed zone, which primarily includes Bright Angel peninsula but also encompasses the North Rim Entrance Road and roads out to the Walhalla Plateau comprises approximately 1,127 acres within the Bright Angel watershed subunit, or approximately 6% of the subunit. Approximately 234 acres of this, or 21%, is disturbed by past activities and developments (Figure 3). Existing developments include roads, trails, parking areas, buildings, and utilities (Figure 3 and Figure 4). The North Rim receives most of its visitation between May and October, when facilities at the North Rim are open. Visitation peaks in the summer months of June and July and is very limited in winter

Figure 2. North Rim Developed Area on Bright Angel Peninsula, showing existing development and foreseeable future projects.

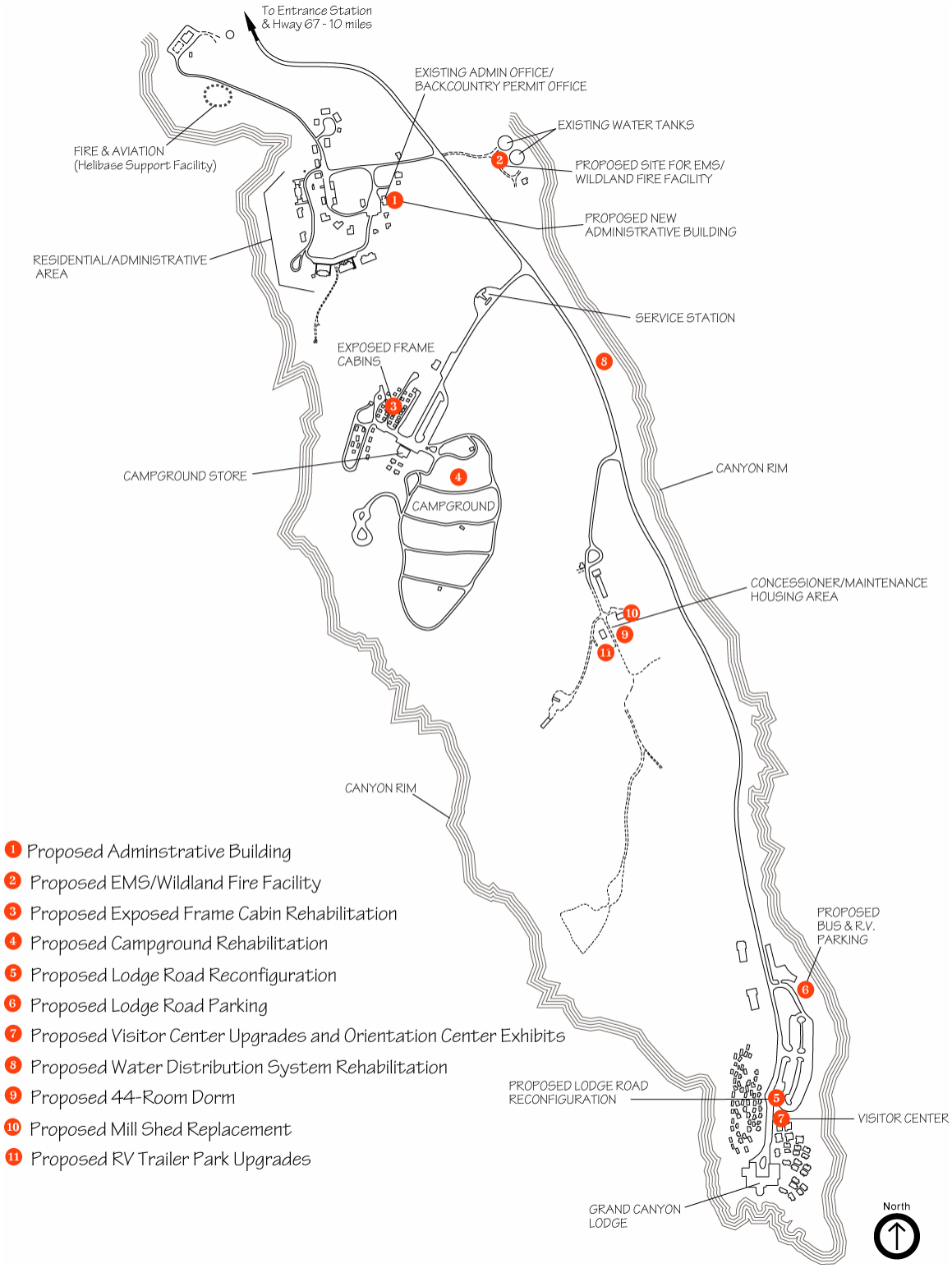


Figure 3. Bright Angel Watershed Subunit and the North Rim Developed Area.

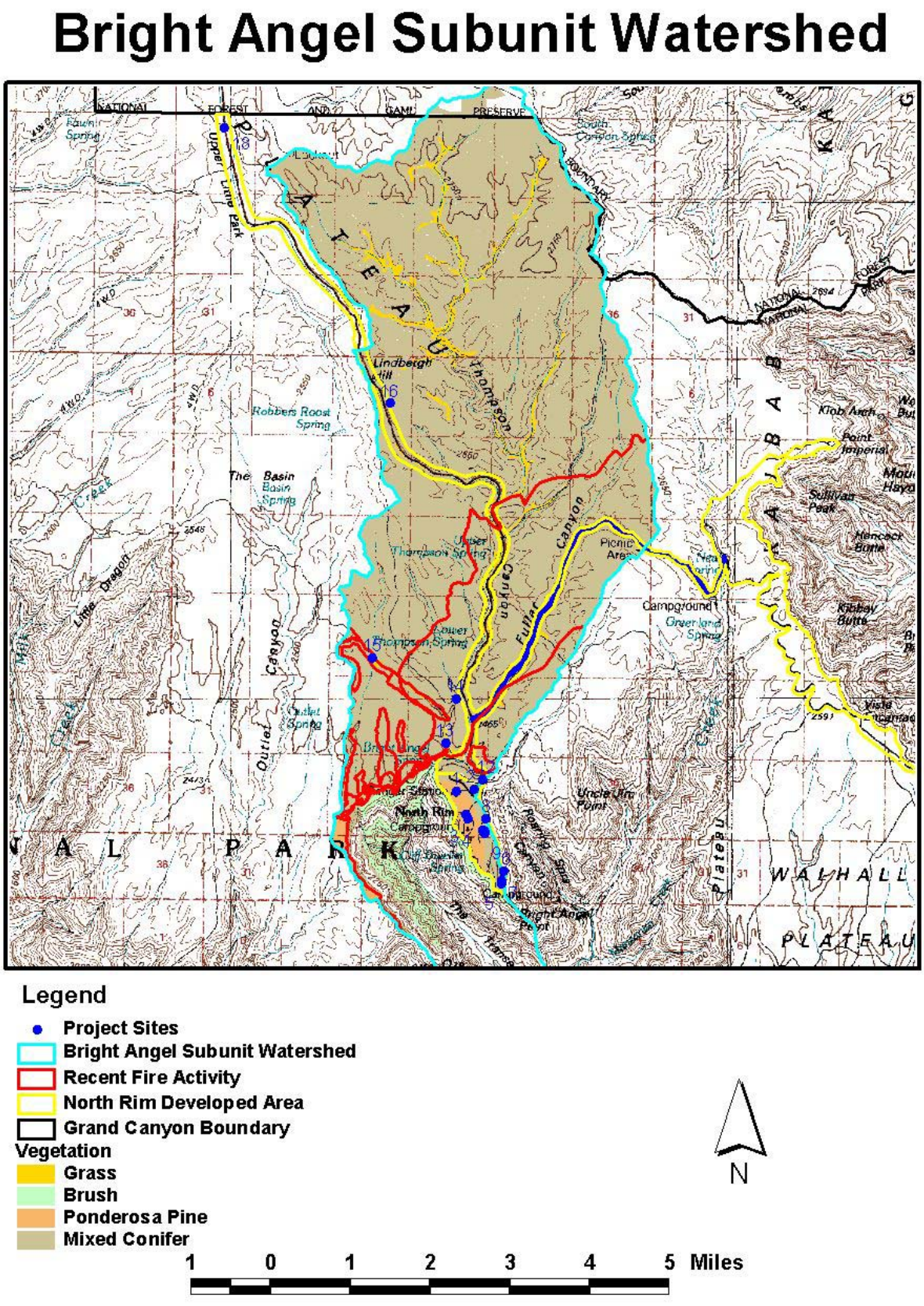
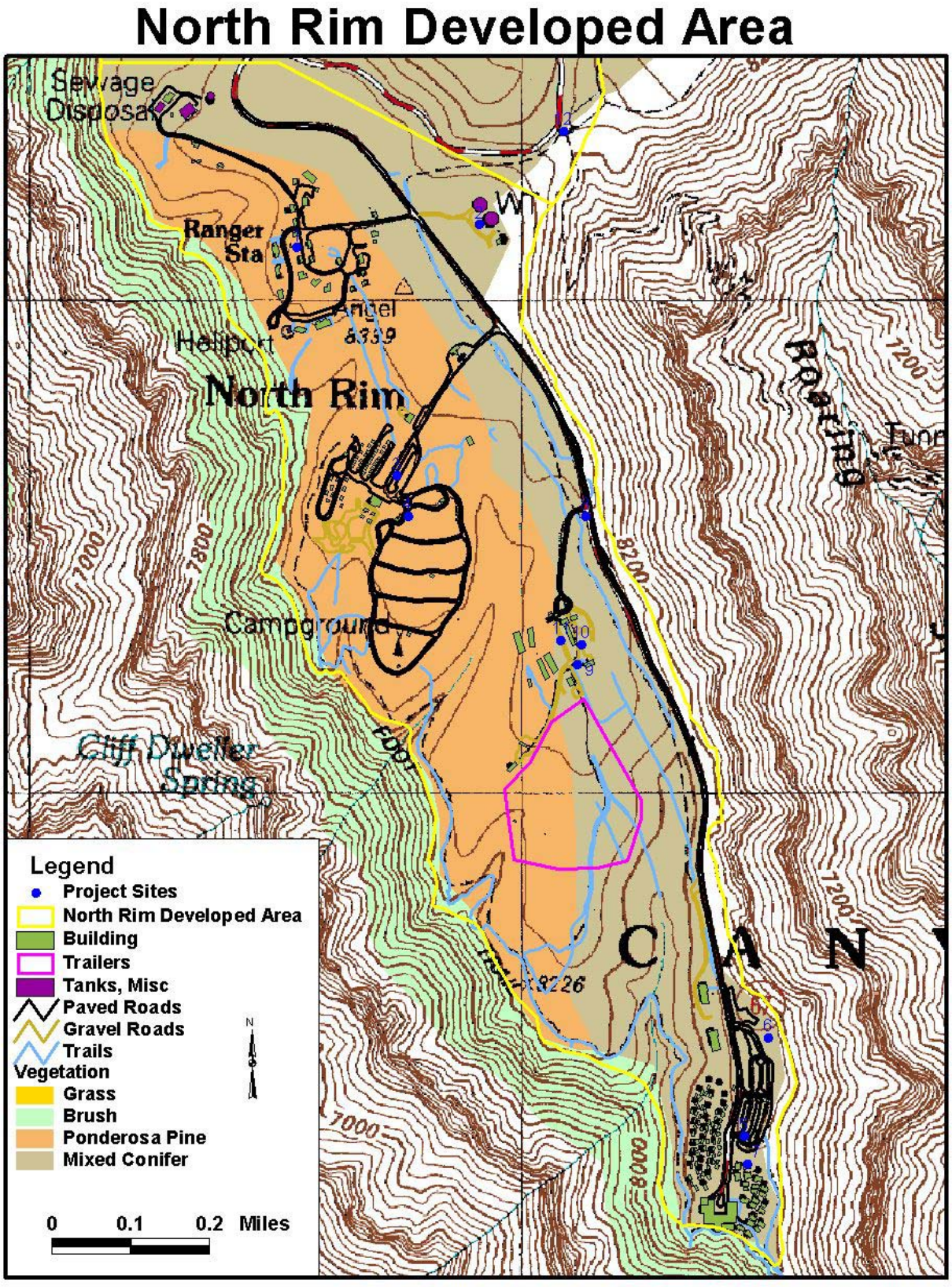


Figure 4. The developed area of the North Rim on Bright Angel Peninsula.



when snow blocks the road. Park staff is present at the North Rim throughout the year, with limited staffing in the winter, and perform general maintenance functions.

The Outlet Fire burned approximately 14,000 acres on the North Rim in May 2000. Approximately 3,772 acres of the burn occurred in the Bright Angel peninsula sub-unit. The fire burned in a mosaic pattern, with areas of low, moderate, and high burn severities throughout the fire perimeter. Long-term monitoring using fixed plots designed to evaluate fire effects over time is in place across much of the Outlet Fire (C. Letz pers. comm. 12/3/02). Prescribed burning has been conducted on approximately 2,203 acres within the watershed subunit. Prescribed burning on the North Rim is designed to reduce hazardous fuel accumulation and restore fire back into the ecosystem in order to reduce the risk of large-scale stand replacing wildfire on the North Rim. Broadcast prescribed burning is the primary tool used on areas outside the Bright Angel peninsula developed area to reduce hazardous fuel accumulations. Both broadcast prescribed burning and understory thinning is used in developed areas to reduce the risk of wildfire and to protect developments and structures in these areas.

Under the no action alternative, no improvements would be made to the North Rim campground or to the water distribution system. Campground roads would remain in their present condition, restrooms would not be rehabilitated, new restrooms would not be constructed and the existing campground entrance kiosk would remain. The water distribution system would not be improved and potable water systems lines would continue to leak and freeze in the shoulder and winter seasons. Water flow and pressure would remain inadequate for fire protection for the North Rim. The reclaimed water line would remain in use as a gravity flow line serving as fire protection only for the lodge area. New hydrants and hose boxes would not be added.

ITEMS APPLICABLE TO BOTH ACTION ALTERNATIVES B AND C:
There are several project components that are common to both action alternatives B and C and are as described below. These project components are analyzed as part of the actions described under both Alternatives B and C. Mitigation measures developed for action alternatives would also apply to these components, and are listed in the Mitigation Measures section of this Chapter.

Water Distribution System Improvements – The existing water distribution system would be upgraded to a single source with dual piping system (Appendix C2). The majority of the existing potable water lines would be replaced with new piping and installed deeper in the soil to prevent freezing. Generally, these lines would be placed in new trenches adjacent to the existing lines where feasible, and/or in areas previously disturbed and free of trees to minimize the need for vegetation disturbance (Figure 5). Some lines, such as the spur line into the campground would be installed under existing roads. Approximately 2.5 acres of ground would be disturbed to install the new pipeline along the existing potable water system, some of this new ground disturbance and some of this in previously disturbed areas. Trenches would be approximately 4 feet wide when two pipes are being installed (limited to the area between the water tanks and the campground) and 2-3 feet wide for the remainder of the pipeline (where only one pipe is installed). Trenches would be approximately 54 inches deep to allow 42 inches of cover over the pipe and may extend into limestone at some locations. Some trees would need to be removed as a result of the new trenching but would be minimal. Based on cursory field inspection of the alignment, up to approximately 20 trees would need to be removed for the new trenching. Most of these trees would be less than 12 inches in diameter and would be both ponderosa pine and aspen. Impacts to vegetation are discussed in more detail in Chapter 3 of this document.

The reclaimed water system already in place on the North Rim but not being used to its fullest extent (shown on the diagram in Appendix C2), would be disconnected from the wastewater

Figure 5. Typical view of the proposed alignment for the improved water distribution system; trenching would occur on or adjacent to existing trails or open areas, as seen here (10/2002).

treatment plant and connected to the potable water system. Potable water would then be used for domestic water consumption and fire protection through the potable piping system, and for fire protection through the existing reclaimed pipeline. The potable water system would supply water to the fire protection system through a backflow preventer at all interconnections to allow potable water to flow into the reclaimed pipeline but not to flow out of it. The existing reclaimed piping could be easily reconnected to the reclaimed water source in the future, should uses for reclaimed water be developed and should improved reclaimed water storage and pressure boosting systems be installed. The existing reclaimed water pipeline is in good condition and does not need to be replaced. No new ground disturbance would be necessary for connection of the reclaimed line to the potable line; all work would occur in existing disturbed areas (i.e. in paved areas or between paved areas and buildings).

An improved pumping station would be installed in the existing pump house near the potable water tanks (Appendix C2) to boost the pressure of the system, specifically to eliminate existing low water pressure and inadequate fire flows in the administration area and the campground area. The pump station would be designed to meet domestic water and fire system demands on the improved potable water pipeline as well as fire system demands on the reclaimed water pipeline. Gravity pressure would continue to feed the lodge area for fire protection through the existing reclaimed pipeline and for domestic water needs and fire system demands through the improved potable water pipeline. Approximately 22 existing fire hydrants would be reused as part of this project, approximately 11 would be replaced and approximately four new fire hydrants would be installed. This project would be implemented in phases, as funding becomes available, and would be staggered over the next several years.

Campground Road Repaving and Accessibility Upgrades – Existing paved campground roads (Appendix C1) would be re-surfaced in kind, for a total of approximately 1.3 miles of resurfacing. Existing material may be salvaged and re-used as base material if economically feasible.

There are currently two campsites that are designated as accessible sites in the North Rim Campground. These two sites would be converted/rehabilitated to universally accessible camping sites and three additional campsites would be converted to accessible sites. These three additional sites would be selected based on proximity to comfort stations, ability to widen the parking space, large tent pad space, and levelness of the site. All five sites would meet the proposed guidelines by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board) for Outdoor Recreation areas. Accessible picnic tables, grills, and campsite signs would be added to each of these sites. Work on these five sites would include grading parking areas and campsites, providing accessible pathways to comfort stations and providing hardened surfaces at each site.

Campground Restroom Rehabilitation – Two Mission 66 comfort stations (see Chapter 3, Page 54-55 for a description of Mission 66 architecture) within the campground would be rehabilitated and the existing historic log comfort station would be repaired (Figure 6). Rehabilitation and repair of the three restrooms would include making them universally accessible and addressing any maintenance needs. Repairs to the log comfort station would be limited to repair of rafter ends and replacement of the existing corrugated metal roof with a corrugated cor-ten metal roof. Modifications to each Mission 66 restroom may include actions such as demolition of some interior walls and partitions, addition of and/or replacement of existing windows and doors, and installation of new plumbing, piping and electrical fixtures. New floor slabs would be added for accessible toilet rooms and a small addition to each building to accommodate an accessible restroom may be necessary. The exterior of the rehabilitated buildings would be similar to the existing buildings but would likely have entry doors moved to the front of the building, opening onto covered porches. Roofs would likely be replaced. Site work would include minimum repair and upgrading of paths and walkways. The specific components necessary for the rehabilitation of the comfort stations and the resulting appearance of each building would be developed more fully among NPS staff during the design phases for this project. This group would evaluate and consider the comments received from the Arizona State Historic Preservation Office and determine the applicability of the Secretary of the Interior's Standards for the Treatment of Historic Properties, park architectural guidelines, and existing management policies, while also addressing the purpose and need for action.

Campground Comfort Station and Vault Toilet Construction – One new comfort station would be constructed at the campground group site in a clearing near the site of the existing toilets (Figure 5). The comfort station would have flush toilets and a total of six-stalls. The building size and design would be similar to the Mission 66 rehabilitated comfort stations, would be fully accessible and would include a corrugated cor-ten metal roof and stucco and vertical siding, designed appropriately for its location within an historic district. This comfort station would be constructed adjacent to the existing gravel road into the group site. A single vault toilet would also be installed in the same general area as the new comfort station and on the site of the existing toilets (Figure 7 and Appendix C1). The single vault toilet would accommodate wintertime visitor use, when the comfort station would be closed. Site work for both the comfort station and the vault toilet would include the addition of accessible walkways. Up to 1 to 3 small pine trees may need to be removed to accommodate the new comfort station and up to 0.5 acres of ground disturbance would result. The specific design of the vault toilet and comfort station would be developed more fully among NPS staff during the design phases for this project. This group would evaluate and consider the comments received from the Arizona State Historic Preservation Office and determine how best to apply the Secretary of the Interior's Standards for the Treatment of Historic Properties, park architectural guidelines, and existing management policies, while also addressing the purpose and need for action.

Figure 6. Existing North Rim Campground Restrooms (2001)

COMFORT STATION – HISTORIC LOG
NO SCALE

COMFORT STATION – NORTH RIM LOWER
NO SCALE

COMFORT STATION – NORTH RIM UPPER
NO SCALE

Alternative B – The North Rim Campground entrance (Figure 8) would be reconfigured under Alternative B. The following actions are part of Alternative B:

- Construct two new entry lanes and one new exit lane
- Construct a new parking area entry
- Construct four new tent campsite access spurs
- Remove the existing fee collection kiosk (Figure 8) and construct a new fee collection booth between the new entrance and exit lanes.
- Remove pavement and revegetate a small area near the existing kiosk.

Appendix C3 shows the proposed layout of the new campground entrance under Alternative B. The reconfiguration of the campground entrance under Alternative B would result in approximately 0.5 acres of new ground disturbance and would require the removal of approximately 30 to 35 ponderosa pine trees. Figure 7 displays a photo of the approximate location of the new campground entrance road under Alternative B.

Alternative C – Preferred Alternative – Under Alternative C, the existing fee collection kiosk would be removed and a new walk-up campground registration building would be constructed (Appendix C4). The new building would be up to approximately 256 square feet in size and would have a covered porch and a walk-up registration window. The design of the building would be in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties (Weeks 1995) due to its location within the North Rim Inn and Campground Historic

Figure 7. Exiting Group Site Restrooms (2001).

EXISTING CONDITIONS
NO SCALE

Figure 8. Existing North Rim Campground Entry Showing Kiosk (2002).

Figure 9. Site of new North Rim Campground entrance road under Alternative B (2000).

District. The specific style and design of the building would be developed in consultation with the State Historic Preservation Officer (SHPO) to ensure that the building would not have an adverse effect to the surrounding district.

A sign would be placed at the entrance to the existing campground parking area to direct campground visitors to the registration building. Some stone curbing along the parking area would be extended and a small segment of trail would be realigned around the new building. The new registration building would be constructed partly within the existing parking area (Figure 10), minimizing the extent of new ground disturbance. It is estimated that 3 to 5 ponderosa pine trees would need to be removed for the new building. Appendix C4 shows the proposed layout of the campground entrance under Alternative C. Visitors would be directed to park in the existing parking area and walk up to the registration building to register. There would be no drive-thru registration. The construction of a new registration building would result in minimal ground disturbance, estimated at less than 0.25 acres. Up to 5 trees may need to be removed to accommodate the new building and the designation of recreational vehicle (RV) parallel parking spaces within the existing parking area. Figure 10 displays the approximate location of the proposed new walk-up registration building under Alternative C.

IDENTIFICATION OF THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which guides the Council on Environmental Quality (CEQ). The CEQ provides direction that "[t]he environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Using selection factors from the Choosing by Advantages process and through the process of internal scoping, scoping with the public and other agencies, the environmentally preferred alternative selected is Alternative C. Alternative C best meets the purpose and need for action and best addresses the overall Park Service objectives and evaluation factors. Alternative C greatly minimizes the level of tree removal and new ground disturbance necessary to meet the purpose and need for action, when compared to Alternative B and better meets evaluation criteria 1 and 4 above. Alternative C also minimizes intrusion into the Inn and Campground Historic District and addresses evaluation criterion 4 more so than Alternative B. No new information came forward from public scoping or consultation with other agencies to necessitate the development of any new alternatives, other than those described and evaluated in this document. Alternative C is recommended as the Preferred Alternative and meets both the Purpose and Need and the project objectives.

Figure 10. Site of new North Rim Campground walk-up registration building under Alternative C (2002).

MITIGATION MEASURES COMMON TO BOTH ACTION ALTERNATIVES

To minimize resource impacts, the integral design features (i.e. mitigation measures) below would be followed during implementation of either of the action alternatives, and are analyzed as part of the action alternatives. These actions were developed to lessen the potential for adverse effects of the proposed action, in combination with foreseeable future actions, and have proven to be very effective in reducing environmental impacts on previous projects.

Contractor Orientation. Contractors working in the Park are given orientation concerning proper conduct of operations. This orientation is provided in both written form and verbally at a preconstruction meeting. This policy will continue on proposed projects. Orientation topics will include:

- Wildlife should not be approached or fed.
- Collecting any Park resources, including plants, animals, and historic or prehistoric materials, is prohibited.
- Contractor must have a safety policy in place and follow it.
- Other environmental concerns and requirements discussed elsewhere in this EA would be addressed, including relevant mitigation measures listed below.

Limitation of Area Affected. The following mitigation measures will be implemented to minimize the area affected by construction activities.

- The staging area for the construction office (a trailer), construction equipment, and material storage will be located in previously disturbed areas near the project site. All staging areas will be returned to pre-construction conditions once construction is complete. Standards for this, and methods for determining when the standards are met, will be developed in consultation with the Park Restoration Biologist.
- Construction zones will be fenced with construction tape, snow fencing, or some similar material before any construction activity. The fencing will define the construction zone and confine activity to the minimum area required for construction. All protection measures will be clearly stated in the construction specifications, and workers will be instructed to avoid conducting activities beyond the construction zone as defined by the construction zone fencing.

Soil Erosion. To minimize soil erosion, the following mitigation measures will be incorporated into the action alternatives.

- Standard erosion control measures such as silt fences, sand bags, or equivalent control methods will be used to minimize any potential soil erosion.
- Any trenching operations will be by rock saw, backhoe, trackhoe, and/or trencher, with excavated material side-cast for storage. After trenching is complete, bedding material will be placed and compacted in the bottom of the trench and the utility lines installed in the bedding material. Back filling and compaction will begin immediately after the utility lines are placed into the trench, and the trench surface will be returned to pre-construction contours. All trenching restoration operations will follow guidelines approved by Park staff. Compacted soils will be scarified and original contours reestablished.

- A Salvage and Revegetation Plan will be developed for the project by a landscape architect or other qualified individual, in coordination with the Park Restoration Biologist. Any revegetation efforts will use site-adapted native species and/or native seed, and Park policies regarding revegetation and site restoration will be incorporated into the plan. The plan will consider, among other things, the use of native species, plant salvage potential, exotic vegetation and noxious weeds, and pedestrian barriers. Policy related to revegetation will be referenced in NPS Management Policies (NPS 2001b; Chapter 9).

Exotic Vegetation and Noxious Weeds. To prevent the introduction and minimize the spread of exotic vegetation and noxious weeds, the following mitigation measures will be incorporated into the action alternatives.

- Existing populations of exotic vegetation at the construction site will be treated prior to construction activities. Because numerous invasive species have been documented along road corridors on the North Rim and much of the trenching necessary for the waterline upgrades would occur near road corridors, pre-treatment of these areas would be necessary prior to implementation.
- A restoration biologist or designated natural resources representative would be on-site during trenching operations to provide input on tree avoidance and salvage potential.
- All construction equipment that would leave the road (e.g., bulldozers and backhoes) will be pressure washed prior to entering the Park.
- The location of the staging area for construction equipment will be Park-approved and treated for exotic vegetation.
- Parking of vehicles will be limited to existing roads or the staging area.
- Any fill, rock, or additional topsoil needed will be obtained from a Park-approved source.
- All areas disturbed by construction will be revegetated using site-adapted native seed and/or plants.

Water Quality. To minimize potential impacts to water quality, the following mitigation measures will be incorporated into the action alternatives.

- A storm water pollution prevention plan (SWPPP) will be developed by the contractor and approved by the Park prior to any ground-disturbing activities. All National Pollutant Discharge Elimination System (NPDES) requirements will be met.
- Standard erosion control measures such as silt fences, sand bags, or equivalent control methods will be used to minimize any potential sediment delivery to streams.

Special Status Species. To protect any unknown or undiscovered threatened, endangered, or special status species, the construction contract will include provisions for the discovery of such. These provisions will require the cessation of construction activities until Park staff evaluate the project impact on the discovery and will allow modification of the contract for any protection measures determined necessary to protect the discovery. Mitigation measures for known special status species are as follows:

California Condor

- Prior to the start of a construction project, the Park will contact personnel monitoring California condor locations and movement within the Park to determine the locations and status of condors in or near the project area.
- If a condor occurs at the construction site, construction will cease until it leaves on its own or until permitted personnel employ techniques that result in the individual condor leaving the area.
- Construction workers and supervisors will be instructed to avoid interaction with condors and to contact the appropriate Park or Peregrine Fund personnel immediately if and when condor(s) occur at a construction site.
- The construction site will be cleaned up at the end of each day that work is being conducted (i.e., trash disposed of, scrap materials picked up) to minimize the likelihood of condors visiting the site. Park condor staff will complete a site visit to the area to ensure adequate clean-up measures are taken.
- To prevent water contamination and potential poisoning of condors, a vehicle fluid-leakage and spill plan will be developed and implemented for this project. This plan will be reviewed by the Park biologist for adequacy in addressing condors.
- If a new structure occurs on the rim or above tree line in other areas, there may be a need to install condor deterrent devices on the structure. This will be evaluated on a case-by-case basis by the Park wildlife biologist.
- If non-nesting condors occur within 1 mile of the project area, blasting will be postponed until condors leave or are hazed by permitted personnel.
- If condor nesting activity is known within 1 mile of the project area, then blasting activity will be restricted during the active nesting season, if viable nests persist. The active nesting season is February 1 to October 15, or until young are fully fledged. These dates may be modified based on the most current information, in consultation with the Park biologist and the USFWS.
- If condor nesting activity is known within 0.5 mile of the project area, then light and heavy construction in the project area will be restricted during the active nesting season, if viable nests persist. The active nesting season is February 1 to October 15, or until young are fully fledged. These dates may be modified based on the most current information, in consultation with the Park biologist and the USFWS.

Mexican Spotted Owl (MSO)

- If a construction project occurs within a Protected Activity Center (PAC) with no known nest site, then all construction activity will be restricted to the non-breeding season (September 1 – February 28). However, if the project in a PAC is at least 0.8 km (0.5 mile) from known nest sites and the project does not include blasting, then the project can be implemented during the breeding season. The breeding season is March 1 – August 31.
- If a construction project outside of PACs occurs within 1.6 km (1 mile) of a known PAC nest or roost site, the boundary of a PAC where the nest or roost site is not known, or unsurveyed restricted, protected, or predicted MSO habitat, then all blasting in that project area will be restricted to the non-breeding season (September 1 – February 28).
- If a construction project outside of PACs occurs within 0.8 km (0.5 mile) of a known PAC nest or roost site, the boundary of a PAC where the nest or roost site is not known, or unsurveyed restricted, protected, or predicted MSO habitat, then light and heavy

construction activity in that project area will be restricted to the non-breeding season (September 1 – February 28).

Cultural Resources. To minimize the impacts of construction activities on cultural resources, the following mitigation measures will be incorporated into the action alternatives.

- If previously unknown archeological resources are discovered during the course of the project, a park archeologist will be contacted immediately. All work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented and an appropriate mitigation strategy developed, if necessary, in accordance with the stipulations of the 1995 Programmatic Agreement among the National Park Service, the Arizona State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding the General Management Plan/Environmental Impact Statement, Grand Canyon National Park, Arizona.
- All workers would be informed of the penalties of illegally collecting artifacts or intentionally damaging any archeological or historic property. Workers would also be informed of the correct procedures if previously unknown resources were uncovered during construction activities.
- Monitoring of trenching across previously undisturbed corridors would be undertaken by a qualified archeologist.
- All undertakings affecting historic buildings and structures will be carried out in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (60 FR 35842-35844) and other applicable NPS cultural resources policies and guidelines.
- Replacement of existing fire hydrants and installation of new hydrants in historic districts has the potential to impact the surrounding district. The colors chosen and the exact placement of the hydrants will be done in consultation with park cultural resource staff to ensure adverse impacts are minimized.
- The specific components necessary for the rehabilitation of the restrooms within the campground and the resulting appearance of each building would be developed more fully among NPS staff during the design phases of this project. This group would evaluate and consider the comments received from the SHPO and determine the applicability of the Secretary of the Interior's Standards for the Treatment of Historic Properties, park architectural guidelines, and existing management policies, while also addressing the purpose and need for action.

Visual Resources. To minimize visual impacts, mitigation measures will include the following:

- Trenching for underground utilities will be limited as much as possible to a 10-foot wide fenced construction zone. Clearing of trees and understory will be feathered to blend with natural openings in the forest canopy.
- Natural, muted colors will be used to blend any metal surfaces into the landscape.
- All contractors will use Lindbergh Hill for primary staging to minimize ground disturbance and to decrease the amount of construction equipment visible to visitors. Secondary staging would occur in existing disturbed areas in or near the campground as needed and as approved by park staff.

Visitor Experience. The following mitigation measures will be incorporated into the action alternatives to minimize the impacts of construction activities on the visitor experience:

- The Park may consider restricting construction activities during peak use days such as holidays and some weekends during the busiest times of the year to minimize disruption to visitors.
- Traffic in any one direction will not be stopped for more than 15 minutes to minimize disruption to traffic flow.
- Unless otherwise approved by the Park, operation of heavy construction equipment will be restricted to 8:00 am to 6:00 pm in the summer (May 1- September 30) and to 9:00 am to 5:00 pm during the rest of the year.
- Information regarding implementation of this project and other foreseeable future projects would be shared with the public upon their entry into the park during construction periods. This may take the form of an informational brochure or flyer about the projects distributed at the gate and sent to those with reservations at park facilities, postings on the park's website, press releases, and/or other methods. The purpose of these efforts would be to minimize the potential for negative impacts to the visitor experience on the North Rim during implementation of this project and other planned projects during the same construction season.

Park Operations. The following mitigation measures will be incorporated into the action alternatives to minimize the impacts of construction activities on park operations:

- An independent contract inspector will be hired so Park staff will not need to monitor day to day contract compliance for this and other projects, when the amount of work exceeds the Park staff's capacity for adequate monitoring.

Air Quality. Air quality impacts of the action alternatives are expected to be temporary and localized. To minimize these impacts, the following actions will be taken:

- To reduce entrainment of fine particles from hauling material, sufficient freeboard will be maintained and loose material loads (aggregate, soils, etc.) will be tarped.
- To reduce tailpipe emissions, construction equipment will not be left idling any longer than is necessary for safety and mechanical reasons.
- To reduce construction dust in the short term, water will be applied to problem areas. Equipment will be limited to the fenced project area to minimize soil disturbance and consequent dust generation.
- Landscaping and revegetation will control long-term soil dust production. Mulch and the plants themselves will stabilize the soil and reduce wind speed/shear against the ground surface.

Alternatives and Project Objectives: The objectives of the action are described in Chapter 1 and also listed here: 1) Provide adequate fire protection and domestic water flows to North Rim developed areas; 2) Improve the quality of the visitor experience at the campground by facilitating visitor check-in, minimizing conflicts with the camper store, and improving the work environment for employees at the fee collection station; 3) Rehabilitate restroom facilities to more effectively shed water and snow, and bring restrooms and associated paths and walks up to current accessibility standards, while recognizing the existing architectural merit of each building proposed for rehabilitation; 4) Replace inadequate chemical toilets at the group campsite with

permanent facilities to accommodate visitors during summer, winter and shoulder seasons; 5) Alleviate soil erosion and compaction problems in the campground by improving the quality of the roads, and 6) Minimize new ground disturbance and tree removal.

The preferred alternative clearly addresses each of these objectives. Alternatives that were considered but dismissed from further analysis were dismissed in part because they did not sufficiently address one or all of these project objectives. Table 2 displays alternative components and compares the ability of the alternatives to meet project objectives. Alternative C greatly reduces the level of new ground disturbance and tree removal necessary to achieve the purpose and need for the project and addresses Objective 6 more fully than Alternative B.

Table 1. Summary of Alternative Components

Component	Alternative A – No Action	Alternative B	Alternative C – Preferred Alternative
Campground Fee Collection Kiosk	Entrance kiosk would remain in place	Kiosk removed; registration moved to a larger drive-up kiosk on a new campground entrance road	Kiosk removed; registration moved to a new larger building adjacent to existing parking area; visitors park and walk up to building to register
Campground Entrance Configuration	Current configuration of entrance would remain	Two new entry lanes and one new exit lane would be constructed. New drive-up registration booth would be constructed.	Current configuration of entrance would remain. Visitors would park and walk up to the new registration building to register
Campground Roads & Accessibility Upgrades	No change in roads or accessible campsites	Approximately 1.3 miles of existing paved roads would be resurfaced; 2 existing accessible sites upgraded to meet current standards; 3 additional accessible sites added	Approximately 1.3 miles of existing paved roads would be resurfaced; 2 existing accessible sites upgraded to meet current standards; 3 additional accessible sites added
Campground Restrooms	3 campground restrooms would remain in current condition; 2 temporary toilets would remain at group site	3 campground restrooms rehabilitated; New one-stall vault toilet constructed at group site; New 6-stall restroom constructed at group site	3 campground restrooms rehabilitated; New one-stall vault toilet constructed at group site; New 6-stall restroom constructed at group site
Water Distribution System	Would remain in current condition	Would be replaced with a single-source with dual piping system; old piping would be replaced with new piping and distribution system upgraded	Would be replaced with a single-source with dual piping system; old piping would be replaced with new piping and distribution system upgraded
Approximate Amount of New Ground Disturbance (acres)	0	1 acre in campground (0.5 acres for entrance and 0.5 acres for restrooms) and 2.5 acres for water system (3.5 acres total)	0.75 acres in campground (0.25 acres for entrance and 0.5 acres for restrooms) and 2.5 acres for water system (3.25 acres total)
Accomplishment of Project Objectives	Does not accomplish project objectives	Accomplishes some project objectives	Accomplishes all project objectives

Table 2. Comparative Summary of Environmental Impacts.

Impact Topic	Alternative A – No Action	Alternative B	Alternative C – Preferred Alternative	Cumulative Impacts
Soils and Water	Minor to moderate impacts; soil erosion and compaction problems at campground would continue; water would continue to be lost through leaking water pipes	Negligible to minor, site-specific, short-term impacts through compaction and displacement of less than 3.5 acres of soil.	Negligible, site-specific, short-term impacts through compaction and displacement of less than 3 acres of soil.	Negligible to minor adverse long-term and short-term effects through soil compaction and displacement, increase in impermeable surfaces, and potential increases in soil erosion.
Vegetation: Acres disturbed; exotic species potential	0	3.5 acres disturbed; Moderate exotic species introduction potential – reduced with mitigation measures	3.25 acres disturbed; Moderate exotic species introduction potential – reduced with mitigation measures	Adverse, site-specific, long-term minor impact on the vegetative community through modification of 253 acres of vegetation from past development actions and proposed future development actions, or a total of 1.3% of the watershed subunit. Minor, adverse, local long-term impacts through previous establishment of exotic vegetation and the potential for spread of exotic vegetation on 19 acres of disturbed ground.

Impact Topic	Alternative A – No Action	Alternative B	Alternative C – Preferred Alternative	Cumulative Impacts
Vegetation: Tree removal	0	30 – 35 ponderosa pine trees for new campground entrance, approximately half of which are large (≥ 18"DBH); 1-3 small ponderosa pine for new restrooms, 10-20 ponderosa pine and aspen trees for water distribution system, most of which are small (< 12" DBH) TOTAL: 41 – 58	3-5 trees for new campground registration building; 1 – 3 small pine trees for new restrooms; 10-20 ponderosa pine and aspen trees for water distribution system, most of which are small (< 12" DBH) TOTAL: 14 – 28	Future planned projects would result in removal of up to 120-150 primarily ponderosa pine trees greater than 12" DBH. Tree removal would occur in small areas for individual projects in the existing developed area of the North Rim.
General Wildlife Populations	Populations generally remain the same; no effect to listed species or species of concern	Minor short-term impacts to general wildlife populations	Minor short-term impacts to general wildlife populations	Minor to moderate adverse, local, short- and long-term impacts through direct disturbance during construction and indirect disturbance through habitat fragmentation as a result of past, present and future actions, minimized by concentration of development on the Bright Angel peninsula.

Impact Topic	Alternative A – No Action	Alternative B	Alternative C – Preferred Alternative	Cumulative Impacts
Special Status Species: Mexican Spotted Owl (MSO)	No change	No direct disturbance of MSO habitat, except for small segment of waterline in mixed conifer habitat near water tanks. This segment will be consulted on separately with FWS; Section 7 determination for remainder of project would be may affect, but is not likely to adversely effect (MANLAA) due to potential impacts of construction noise	No direct disturbance of MSO habitat, except for small segment of waterline in mixed conifer habitat near water tanks. This segment will be consulted on separately with FWS; Section 7 determination for remainder of project would be MANLAA due to potential impacts of construction noise	Modification of potential foraging habitat, slight modification of potential nesting habitat for some future projects. Daily human activity on the Bright Angel peninsula would constitute a negligible to minor adverse, long-term, local effect to MSOs.
California Condor	No change	Negligible to minor short-term adverse impacts through increased likelihood of contact between condors and humans during construction. Section 7 determination would be MANLAA.	Negligible to minor short-term adverse impacts through increased likelihood of contact between condors and humans during construction. Section 7 determination would be MANLAA.	Minor local, long- and short-term adverse impacts through increased likelihood of contact between condors and humans.
Peregrine Falcon	No change	Negligible long-term adverse impacts through minor modification of potential foraging habitat	Negligible long-term adverse impacts through minor modification of potential foraging habitat	Negligible adverse local long-term adverse impacts through modification of potential foraging habitat

Impact Topic	Alternative A – No Action	Alternative B	Alternative C – Preferred Alternative	Cumulative Impacts
Northern Goshawk	No change	Negligible to minor adverse long-term impacts through minor modification of potential nesting and foraging habitat; negligible short-term impacts during construction	Negligible to minor adverse long-term impacts through minor modification of potential nesting and foraging habitat; negligible short-term adverse impacts during construction	Minor adverse long- and short-term local effects through daily disturbance in developed areas during the breeding season and modification of potential nesting and foraging habitat
Kaibab Squirrel	No change	Minor long-term adverse impacts through loss of potential nesting, foraging and sheltering sites in ponderosa pine habitat; minor short-term adverse impacts during construction	Minor long-term adverse impacts through loss of potential nesting, foraging and sheltering sites in ponderosa pine habitat; minor short-term adverse impacts during construction	Minor to moderate long-term local adverse impacts through loss or modification of potential nesting, foraging and sheltering sites in ponderosa pine habitat in the developed areas of the North Rim; moderate short-term adverse impacts during construction
Cultural Resources	Minor long-term adverse impact through continued deterioration of the campground and restrooms. Potential for moderate adverse effects to historic structures if fire protection system not improved.	Loss of integrity to historic campground entrance road resulting in a minor long-term adverse impact. Section 106 finding would, however, be a no adverse effect.	Minor to moderate long-term beneficial impacts to historic structures with improvements in fire protection system. Minor to moderate long-term beneficial impacts to campground and restrooms from rehabilitation. Section 106 finding would be a no adverse effect.	Adverse cumulative effects would be moderate, local, and long-term and would primarily be the result of past actions. Beneficial cumulative effects under the action alternatives would be moderate and long-term.

Impact Topic	Alternative A – No Action	Alternative B	Alternative C – Preferred Alternative	Cumulative Impacts
Park Operations	No change; minor to moderate adverse impacts would continue due to continued maintenance needs for substandard water system and campground facilities.	Minor to moderate long-term beneficial impacts through increased water system efficiency and decreased roads/facilities maintenance needs; increase in number of facilities and length of roads to maintain.	Minor to moderate long-term beneficial impacts through increased water system efficiency and decreased roads/facilities maintenance needs; increase in number of facilities to maintain (but no increase in roads).	Moderate long-term beneficial impacts through implementation of multiple projects designed to improve park facilities and operational efficiency; moderate short-term adverse impacts during construction.
Visitor Experience	No change; long-term minor adverse impacts would continue due to vehicle stacking at campground, and substandard restroom facilities.	Minor short-term adverse impacts through increased noise and traffic delays during construction; Minor to moderate long-term beneficial impacts with new campground entrance, roads and upgraded restroom facilities.	Minor short-term adverse impacts through increased noise and traffic delays during construction; Minor to moderate long-term beneficial impacts with new campground entrance, roads and upgraded restroom facilities.	Short-term cumulative impacts to visitor experience would be adverse, moderate and local. Long-term cumulative effects would be beneficial, moderate and local.

Chapter 3 – Affected Environment and Environmental Consequences

INTRODUCTION

This Chapter describes the present condition (i.e. affected environment) within the project area and the changes (i.e. environmental consequences) that can be expected from implementing the action alternatives or taking no action at this time. The no action alternative sets the environmental baseline for comparing the effects of the other alternatives. The impact topics (see Chapter 1) define the scope of the environmental concern for this project. The environmental effects, or changes from the present baseline condition, described in this chapter reflect the identified relevant impact topics, and include the intensity and duration of the action, mitigation measures and cumulative effects.

The National Environmental Policy Act (NEPA) requires that environmental documents disclose the environmental impacts of proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the proposed action be implemented.

Grand Canyon National Park encompasses approximately 1.2 million acres in northern Arizona. The project is located on the North Rim. The entire North Rim drains south into the Grand Canyon. Although it appears relatively flat, numerous drainages and canyons cut the North Rim. The project area is located on Bright Angel Peninsula, a narrow portion of the Kaibab Plateau on which most of the development on the North Rim is located. The project area is on relatively flat terrain at approximately 8,300 feet in elevation.

METHODOLOGY

The impact analysis and conclusions contained in this chapter were based on park staff knowledge of the resources and site; review of existing literature and park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area.

Potential impacts in this chapter are described in terms of type (are the effects beneficial or adverse?), context (are the effects site-specific, local or even regional?), duration (are the effects short-term or long-term?), and intensity (negligible, minor, moderate or major). Because definitions of intensity can vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this EA.

For purposes of impact analysis in this Chapter, the following definitions of duration are used to characterize impacts discussed.

- Short-term – temporary effects typically confined to the construction period.
- Long-term – more permanent effects that will remain following construction.

Cumulative Impacts

Cumulative impact is defined as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over a period of time (40 CFR 1508.7). Therefore, it is necessary to identify other ongoing or foreseeable future actions within the vicinity of the project area.

The area of cumulative impact was chosen to be the Bright Angel watershed subunit (Figure 3). This subunit is approximately 19,415 acres in size and includes the 340-acre Bright Angel peninsula (Figure 4) and much of Highway 67 to the North Rim entrance station. The area of impact was chosen to be the Bright Angel watershed subunit because of the potential for impacts of multiple actions on the natural environment within one watershed.

Past and present activities that have affected the Bright Angel peninsula and the surrounding area include the Outlet Fire, past prescribed burns, and existing development and visitation at the North Rim. Existing developments (roads, trails, parking areas, buildings, and utilities) have affected approximately 234 acres within the Bright Angel watershed subunit . The North Rim receives most of its visitation between May and October, when facilities at the North Rim are open. Visitation peaks in the summer months of June and July and is very limited in winter when snow blocks the road. Park staff is present at the North Rim throughout the year, with limited staffing in the winter, and perform general maintenance functions.

The Outlet Fire burned approximately 14,000 acres on the North Rim in May 2000. Approximately 3,772 acres of the burn occurred in the Bright Angel Peninsula sub-unit. The fire burned in a mosaic pattern, with areas of low, moderate, and high burn severities throughout the fire perimeter. Areas with higher burn intensities are experiencing successful aspen regeneration, indicating that a type conversion from a primarily mixed conifer stand to a stand dominated by aspen may be occurring in some areas of the fire. Long-term monitoring using fixed plots designed to evaluate fire effects over time is in place across much of the Outlet Fire (C. Letz, personal communication, 3 December 2002). Prescribed burning has been conducted on 2,203 acres within the watershed sub-unit since 1997. Prescribed burning on the North Rim is designed to reduce hazardous fuel accumulation and restore fire to the ecosystem to reduce the risk of large-scale stand replacing wildfire on the North Rim. Broadcast prescribed burning is the primary tool used on areas outside the Bright Angel Peninsula developed area to reduce hazardous fuel accumulations. Both broadcast prescribed burning and understory thinning are used in developed areas to reduce the risk of wildfire and to protect developments and structures in these areas.

For this analysis, foreseeable future actions were considered to be actions that currently have funding or for which funding is being sought and that could occur within the next five years. Five years was selected as the period for foreseeable future actions because many of the actions identified in the GMP are likely to be either planned or implemented by that time. Twenty improvement projects, in addition to the proposed action, are planned within the Bright Angel Peninsula subwatershed and would result in disturbance to approximately 16 acres of ground. Most of this area has been previously disturbed. Approximately 120 - 140 trees greater than 12 inches in diameter at breast height (dbh) would be removed for these projects. These projects are summarized in Appendix G and displayed in Figures 2 and 3. Over the next five years, prescribed fire is planned for 1,000 acres in 2004 and 500 acres in 2006 within the Bright Angel Peninsula sub-unit.

Cumulative impacts are expected to be similar for any alternative selected because of the small amount of disturbance relative to the watershed as a whole. If the No-Action Alternative were selected, and all other future projects were implemented, the impacts to the natural environment would still be similar to those that would occur if any one of the action alternatives for this project were selected. The differences between the action alternatives are also not measurable, when combined with other future actions on a watershed level. Therefore, the analysis applies to any alternative selected.

A cumulative impact analysis was conducted for the full implementation of the GMP and is documented in the EIS. The general finding in the EIS for cumulative effects to natural resources was a net reduction in natural habitat within the Park and the region, but a net reduction less than that for two other alternatives analyzed. Cumulative effects to archeological resources could occur, specifically to traditional cultural properties, but a planned ethnographic survey program would minimize this likelihood. Cumulative effects were not expected to historic structures under the assumption that existing cultural resources within the park would be protected and preserved and some historic buildings would be rehabilitated and restored. Cumulative effects to visitor experience in the Park under implementation of the GMP were expected to be positive overall as the result of additional food service and accommodations and contributions to regional and national efforts to expand informational resources, expand interpretive and educational opportunities, and disperse tourism in the area. Because the GMP was a general concept plan and because it required that site-specific analyses be conducted for projects identified in the GMP, a cumulative effects analysis that is more specific to impact topics pertaining to the North Rim campground rehabilitation and water distribution system improvements is needed.

Cumulative impacts are expected to be similar for any alternative selected because of the small amount of disturbance relative to the watershed as a whole. If the No-Action Alternative were selected, and all other future projects were implemented, the impacts to the human environment would still be similar to those that would occur if any one of the action alternatives for this project were selected. Cumulative impacts are described in this Chapter for each impact topic.

Impairment

In addition to determining the environmental consequences of implementing the alternatives, National Park Service policy (*Management Policies 2001*) requires analysis of potential effects to determine whether actions would impair park resources.

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute impairment. An

impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. The potential for impairment is discussed for each applicable resource for each alternative in this chapter. A statement summarizing the conclusions of this evaluation is included in the conclusion statement at the end of the environmental consequences section for each applicable resource in this chapter.

NATURAL RESOURCES

SOIL AND WATER

Affected Environment

The developed areas of the North Rim, including the project location, are underlain by Kaibab limestone, a very porous rock layer. This and other porous sedimentary layers of Grand Canyon create a subdued karst topography in which numerous solution channels and sinks have formed. Little or no surface water is present because water penetrates through the soil and rock layers quickly. Soils tend to be shallow and poorly developed, but stable, with frequent rock outcroppings. Soil horizons and structure are well developed and are well drained. Productivity of most soils in the Park is low, so that revegetation is slow and usually requires considerable maintenance. However, North Rim soils are generally deeper and retain more moisture than South Rim soils so that revegetation efforts are generally more successful here (GMP 1995). Warren (1982) describes soils in the vegetation type characteristic of the project area as moderately deep with loamy texture, derived from Kaibab limestone. A soil survey of the Grand Canyon has been conducted over the last several years by Natural Resources Conservation Service (NRCS). The study has documented that soils in the developed area of the North Rim are generally rocky and cobbly, with varying amounts of clay. Bedrock is typically 30-60 inches below the soil surface (NRCS 2001). Soils in the project area are in satisfactory condition (indicating the soil has retained its inherent productivity). This is due to the presence of needlecast and downed woody material that protects the soil from erosion by preventing raindrops from directly impact soil particles (Kohnke and Franzmeier 1995) and the overall lack of any previous significant ground disturbance such as wildlife or domestic livestock grazing pressure. Due to the soil types in the area, building foundations should be built on bedrock 30-60 inches below the soil surface (Lindsay, pers. comm.)

The project area is located within the Bright Angel Creek watershed subunit (Figure 3). There is no standing water nor any major or minor drainages in the project vicinity. There is no riparian habitat present within or adjacent to the project area. Although the North Rim has a few sinkhole ponds, wet meadows and small springs, there is very little surface water on the plateaus of Grand Canyon National Park, and there is no surface water within the developed portion of the North Rim. Most water movement in this area is subsurface flow.

Environmental Consequences

Methodology

The baseline information used to assess impacts to soil and water resources is as described in the methodology section at the beginning of this chapter and includes park staff knowledge of the resources and site; review of existing literature and park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Additional sources of information on soil and water resources used as a basis for this evaluation are as described above in the affected environment section.

The thresholds of change for the intensity of an impact on soil and water resources are defined as follows:

Negligible – a change to soil or water resources that is not measurable or perceptible.

Minor – a measurable or perceptible, small, localized change to soil or water resources. The change is of little consequence.

Moderate – a change to soil or water resources that is measurable and of consequence but is localized.

Major – a measurable change to soil or water resources that is large and/or widespread and could have permanent consequences for the resource.

Alternative A – No Action

Direct/Indirect Effects. Approximately 234 acres of soil have been disturbed for existing developments in the 19,415-acre Bright Angel watershed subunit. Construction activities can result in reduced water infiltration, reduced soil porosity, reduced water holding capacity, reduced aeration of the soil, increased surface runoff, and increased soil erosion (except in those areas that are covered by impervious surfaces) through the compaction and displacement of soil. Because of the high porosity of the soils, low rainfall, and lack of steep slopes at the North Rim, these effects have been minor. The impacts to soil and water resources have been adverse, minor, local, and long-term. No construction activities are proposed under Alternative A, and this alternative would result in no additional effects to soil and water resources.

Effects Common to All Action Alternatives

Direct/Indirect Effects. Approximately 3 acres of soil would be disturbed under either alternative (3.25 for Alternative B and 3.5 acres for Alternative C). The portion of the disturbance for the campground would be covered with buildings, pavement, or other impervious surfaces and would not be susceptible to future erosion. The portion for the water distribution system would remain undeveloped following installation of the new piping but would be revegetated. The majority of water would continue to be lost through percolation, and surface runoff from the North Rim would remain associated with severe storm events. Due to this low level of ground disturbance, the quality of ground and surface water would not be measurably affected by the proposed developments.

Any increases in sedimentation during construction and trenching activities would be minimal because of the lack of surface water runoff and implementation of standard soil erosion control measures. In addition, the potential impacts of increased sedimentation would be limited to the period of construction and vegetation recovery. Mitigation measures that have been included for the action alternatives are designed to minimize soil disturbance and increased runoff during construction. Therefore, direct and indirect effects to the soil and water resources under Alternative B would be negligible, local, adverse, and both long- and short-term.

Cumulative Impacts. Past and present development has resulted in soil compaction and displacement on approximately 234 acres within the Bright Angel watershed subunit, and foreseeable future development would affect approximately 19 acres of soil (16 acres for foreseeable future projects and 3 acres for preferred alternative). Figure 3 displays the Bright Angel watershed subunit, vegetation types within the subunit and foreseeable future actions. Future actions are described briefly in Appendix G and displayed on Figures 2 and 3. All of these future projects would occur within the developed area of the North Rim and would be in, or in close proximity to, previously disturbed and developed areas. A developed zone for the North Rim has been identified in the 1995 GMP and is used to guide management actions. This developed zone, which primarily includes Bright Angel peninsula but also encompasses the North Rim Entrance Road and roads out to the Walhalla Plateau comprises approximately 1,127 acres within the Bright Angel watershed subunit, or approximately 6% of the subunit. Approximately 234 acres of this, or 21%, is disturbed by past activities and developments. Existing developments include roads, trails, parking areas, buildings, and utilities (Figure 3 and Figure 4). Mitigation measures would be implemented for these future actions and would minimize effects on soil erosion and surface water. Any increases in soil erosion would be limited to the period of construction and vegetation recovery.

The Outlet Fire burned approximately 3,772 acres in the Bright Angel watershed subunit in May 2000. The fire burned in a mosaic pattern, with areas of low, moderate, and high burn severities throughout the fire perimeter. The short-term impacts of this fire on soil and water resources include increased soil movement, soil loss, and sedimentation into downstream drainages. These short-term impacts should stabilize within 3-5 years. Prescribed burns have also occurred within the watershed subunit, totally approximately 2,203 acres over the last several years. More burns are planned and are expected to be implemented on 1,500 acres over the next five years. Although these prescribed burns are a disturbance to the site and result in some changes to vegetation and ground cover in the areas burned, they would not appreciably or measurably affect soils. Soil movement may result following the burn due to the temporary loss of ground cover in some areas, but this movement would be limited to small areas, generally less than 1 acre in size and distributed throughout the burn unit, where prescribed fire intensity was greatest due to existing high fuel loads. Combining the Outlet Fire, prescribed fire and existing and future development within the Bright Angel watershed subunit would result in disturbance to approximately 7,729 acres, which is less than 40 % of the watershed subunit. The majority of the watershed subunit is essentially undisturbed ponderosa pine and mixed conifer forest within the park boundary (Figure 3). Therefore, cumulative effects on soil and water resources would be negligible to minor, short- and long-term, local, and adverse.

Impairment. Adverse impacts under any alternative would be negligible to minor. Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or (3) identified as a goal in the Park's general management plan or other relevant NPS planning documents, there would be no impairment of the Park's resources or values.

Conclusion
The No-Action Alternative would result in the least impact to soil and water resources. Impacts to soil and water resources would be somewhat less for Alternative C than for Alternative B, but still considered negligible for both action alternatives. Cumulative impacts, regardless of the alternative selected for this project, would be negligible to minor, and none of the alternatives would result in impairment of soil or water resources. Mitigation measures that have been included for action alternatives are designed to keep erosion and sedimentation within acceptable limits by minimizing soil disturbance and increased runoff during construction. Toxic materials will not be introduced into the soils or watershed during construction activities, and permit clauses would address spillage situations. The lack of steep slopes, perennial water, or drainages in the project area also substantially reduces the risk of negative impacts to soils and water off the project site.

VEGETATION

Affected Environment

The major vegetation type on the North Rim is Rocky Mountain montane conifer woodland. Four montane coniferous forest communities are distributed in broad elevation bands across the north rim. At the highest elevations above 8,800 feet is a mixed conifer forest dominated by Engelman spruce, white fire, ponderosa pine and Douglas fir. Below this, from about 8,400 feet is a community dominated by ponderosa pine and Douglas fir. Below this, from about 8,000 feet is a community dominated by ponderosa pine and white fir. The last community forms a broad belt from about 8,000 feet to the plateau rim at 7,600 feet with ponderosa pine as a single dominant.

The one abundant deciduous tree on the North Rim is quaking aspen, and it is common throughout all of these forest communities (Warren et. al 1982). Understory deciduous shrubs common to all forest types include Gambel's oak, New Mexico locust and service berry.

The specific project area falls within the Ponderosa Pine – New Mexican locust – Gambel's Oak Series (Warren et. al. 1982). The physiognomy of this type includes open park-like stands, deciduous shrubs patchily distributed in clumps in the understory, and variable herbaceous ground cover. Quaking aspen also occurs within this type, typically in drainages at the higher elevations (Warren et. al. 1982). Generally speaking, the campground occurs in ponderosa pine habitat and the water distribution system improvements occurs in both ponderosa pine and some mixed conifer forests (Figure 4).

There are 19 exotic plant species of primary concern on the North Rim (Appendix E). Exotic species of highest concern on the North Rim include red top grass (*Agrostis stolonifera*), smooth brome (*Bromus inemis*), oxeye daisy (*chrysanthemum leucanthrum*), houndstongue (*Cynoglossum officinale*), orchard grass (*Dactylis glomerata*), Dalmatian toadflax *(Linaria dalmatica*), horehound (*Marribium vulgare*) and Johnson grass (*Sorghum halepense*). These will be the focus of surveys and mitigation measures to minimize the potential for introduction or spread in the project area.

Environmental Consequences

Methodology

The baseline information used to assess impacts to vegetation is as described in the methodology section at the beginning of this chapter and includes park staff knowledge of the resources and site; review of existing literature and park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Additional sources of information on vegetation used as a basis for this evaluation are as described above in the affected environment section.

The thresholds of change for the intensity of an impact to vegetation are defined as follows:

Negligible – a change to a biotic community that is not measurable or perceptible.

Minor – a measurable or perceptible, small, localized change to a biotic community. The change is of little consequence.

Moderate – a change to a biotic community that is measurable and of consequence but is localized.

Major – a measurable change to a biotic community. The change is large and/or widespread and could have permanent consequences for the species or resource.

Alternative A – No Action

Direct/Indirect Effects. Approximately 234 acres of montane conifer forest have been modified with existing developments in the 19,415-acre Bright Angel watershed subunit. This impact to vegetation is considered adverse, but site-specific and confined to existing developed areas, so constitutes a long-term but minor effect to vegetation in this area. No vegetation manipulation or construction activities are proposed under Alternative A, and this alternative would result in no additional effects to the biotic community. The No Action alternative would maintain the existing vegetation community in its current condition and would not require any tree removal. However, it should be noted that the existing water system is considered inadequate to properly protect all of the resources on the North Rim, including historic structures, or to adequately control a fire that might occur on the Bright Angel peninsula under drought conditions. This inadequacy in the fire protection system, particularly in light of the existing drought conditions on the North Rim, has the potential to result in adverse impacts to natural and cultural resources, including vegetation and wildlife habitat.

The construction of existing roads and buildings in the Bright Angel watershed subunit has resulted in the presence of exotic vegetation in these areas. Approximately 234 acres of ground has been disturbed for the construction of existing visitor services, housing, roads, and utilities. Ongoing exotic vegetation control programs, which include hand pulling, mechanical treatments, and a small amount of herbicide control, would continue under the No-Action Alternative. Because the size of the current program is limited, existing populations of exotic vegetation would continue to spread and slowly replace native vegetation. This would most likely occur along roads and utility corridors. These impacts would be minor, adverse, local, and long-term. This alternative would not implement any new ground-disturbing activities and thus would have no additional effects on exotic vegetation or noxious weeds.

Effects Common to All Action Alternatives

Direct/Indirect Effects. Loss of vegetation for construction of the new campground registration building, new restrooms, and the trenching required for the water system improvements would likely have negligible, adverse, local, long-term effects on vegetation communities. There is a possibility that construction activities and trenching under any action alternative could damage tree root systems in the area. Root damage can sometimes result in tree mortality within a 5-10 year period. This would create the potential for hazard trees adjacent to the project area over time, and the need for them to be removed in the future.

Common to both action alternatives, one to three small pine trees may need to be removed for the construction of the new restroom facilities at the group site and up to 20 trees may need to be removed for the necessary trenching for the water distribution system improvements. The majority of these would be small and generally less than 12 inches DBH.

Because the existing water system is considered inadequate to properly protect all of the resources on the North Rim or to adequately control a fire that might occur on the Bright Angel peninsula under drought conditions, improvements in the water system has the potential to result in beneficial impacts natural resources, including vegetation and wildlife habitat.

An increase in the amount of disturbed ground would increase the potential for the spread or introduction of exotic vegetation. However, that portion within the campground would not be subject to potential exotic vegetation invasion because it would be covered by impervious surfaces. In addition, mitigation measures such as pressure washing of ground-disturbing equipment would substantially reduce the risk of introducing a new exotic species. Post-construction revegetation, monitoring, and treatment would also reduce the risk of spreading existing populations and introducing new species. Overall impacts of either action alternative on the spread and introduction of exotic vegetation, like Alternative C, would be adverse, negligible, local, and long-term.

Cumulative Impacts: In addition to the approximately 234 acres of habitat that have been impacted by existing development, modification of an additional 19 acres would occur as the result of foreseeable future development and construction-related projects in the North Rim developed area (Figure 2, Figure 4, Appendix G). All of these future projects would occur within the developed area of the North Rim and would be in, or in close proximity to, previously disturbed and developed areas. Up to approximately 120 - 150 large (greater than 12 inches DBH) ponderosa pine trees may need to be removed as a result of implementation of foreseeable future projects. This adverse impact on the vegetative community would be site-specific, long-term, and minor when future projects are implemented in combination with impacts already existing from past actions. Cumulative impacts would include decreased wildlife security, disturbance to adjacent habitat, and fragmentation in the North Rim. However, this disturbance of vegetation and wildlife habitat through planned projects and associated tree removal would occur within the existing developed are of the North Rim where development already exists and visitation levels are high in peak season. These local, short- and long-term, adverse impacts would be minor because of the widespread availability of montane conifer habitat within the Bright Angel watershed subunit and the concentration of the disturbance in a relatively small area of the peninsula, which comprises a small percentage of the watershed as a whole.

The Outlet Fire, as described previously, burned approximately 14,000 acres on the North Rim in May 2000. Approximately 3,772 acres of the burn occurred in the Bright Angel watershed subunit. The fire burned in a mosaic pattern, with areas of low, moderate, and high burn severities

throughout the fire perimeter. Areas with higher burn intensities are experiencing successful aspen regeneration, indicating that a type conversion from a primarily mixed conifer stand to a stand dominated by aspen may be occurring in some areas of the fire. Long-term monitoring using fixed plots designed to evaluate fire effects over time is in place across much of the Outlet Fire (C. Letz pers. comm.. 12/3/02). Because burned areas within the Outlet Fire perimeter will recover and are providing suitable habitat for a variety of wildlife and plant species, the effect of the Outlet fire is not considered a net loss of vegetation or habitat, and now contributes vegetative and habitat diversity to the area.

Prescribed burning has been conducted on 2,203 acres within the watershed subunit and is planned for an additional 1,500 acres over the next five years within the subunit. Prescribed burning on the North Rim is designed to reduce hazardous fuel accumulation and restore fire back into the ecosystem in order to reduce the risk of large-scale stand replacing wildfire. Broadcast prescribed burning is the primary tool used on areas outside the Bright Angel peninsula developed area to reduce hazardous fuel accumulations. Both broadcast prescribed burning and understory thinning is used in developed areas to reduce the risk of wildfire and to protect developments and structures in these areas. Although prescribed burning results in changes to the vegetative composition of stands treated, these changes are typically limited to the understory and are short-term changes. Prescribed fire would not result in changes to the overall vegetation type or stand composition. For these reasons, prescribed fire would not result in substantial changes in the long-term use of these areas by wildlife and are designed to provide for the natural inherent variability in these stands. Short-term and long-term impacts to vegetation from the Outlet Fire, past prescribed burns and from proposed future prescribed burns may result, as described above, but would still constitute less than 40 % of the watershed subunit. The vast majority of the watershed subunit is essentially undisturbed ponderosa pine and mixed conifer forest within the park boundary. Therefore, cumulative effects to vegetation would be adverse, but minor and both short- and long-term.

Impairment. Adverse impacts to the biotic community under any alternative would be negligible to minor. Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or (3) identified as a goal in the Park's general management plan or other relevant NPS planning documents, there would be no impairment of the Park's resources or values.

Alternative B

Direct/Indirect Effects: Alternative B would result in the loss of approximately 30-35 ponderosa pine trees for the new campground entrance, half of which are large trees, greater than 18 inches in diameter at breast height (DBH). Combining this tree removal with that estimated for the campground restroom construction and the water distribution system improvements would result in the removal of approximately 41 – 58 primarily ponderosa pine trees. This level of tree removal is substantial when compared to tree removal estimates for Alternative C, and even when compared to estimates of tree removals for future projects. Alternative B would result in minor long- and short-term, local, adverse impacts to vegetation.

Alternative C – Preferred Alternative

Direct/Indirect Effects. Alternative C would result in less ground disturbed than Alternative B, since Alternative C does not include the construction of a new campground entrance road. Alternative C would result in the loss of approximately 3-5 ponderosa pine trees for the new campground registration building. Combining this tree removal with that estimated for the campground restroom construction and the water distribution system improvements would result in the removal of approximately 14 – 28 primarily ponderosa pine trees. This level of tree

removal is substantially less than that estimated for Alternative B. Alternative C would result in negligible long- and short-term, local, adverse impacts to vegetation.

Conclusions
The No-Action Alternative would result in the least impact to vegetation. Alternative C would result in less new ground disturbance and substantially less tree removal than Alternative B. Alternative B would result in minor long- and short-term, local, adverse impacts to vegetation while Alternative C would result in negligible long- and short-term, local, adverse impacts to vegetation. Cumulative impacts would also be adverse, but would still be minor due to the extent of undisturbed montane conifer forest in the Bright Angel watershed subunit and the small percentage the developed portion of the North Rim comprises of the available forested area within the watershed subunit.

WILDLIFE

Affected Environment

General Wildlife: Mammals typically associated with montane conifer forests on the North Rim include porcupine, mule deer, 19 species of bats, montane voles, chipmunks, and Kaibab squirrels. Birds include red-faced warbler, pine siskin, yellow-rumped warbler, pygmy nuthatch, western bluebird, blue grouse, Merriam's turkey, and several species of hawks (red-tailed hawk, Cooper's hawk, sharp-shinned hawk, and northern goshawk). Amphibians and reptiles include tiger salamander, northern leopard frog, western rattlesnake, ringneck snake, and western skink (Brown 1994). Those species that are not considered special status species, but for which there is interest in and concern for their populations on the North Rim, are listed in the following table and discussed briefly below. This list was developed based on input from biologists from the Park, AGFD, and USFWS.

Table 3. Species of Interest on the North Rim.

Common Name	Scientific Name
Mule deer	*Odocoileus hemionus*
Blue grouse	*Dendragapus obscurus*
Desert bighorn sheep	*Ovis canadensis*
Mountain lion	*Felis concolor*
Voles and shrews	*Microtus* spp. and *Sorex s*pp.
Ferruginous hawk	*Buteo regalis*
Flammulated owl	*Otis flammeolus*
Breeding birds	Various species, see below

The campground and water distribution system projects would occur in habitat suitable for mule deer, voles and shrews, and breeding birds. Because the project area is relatively small, it is unlikely that mule deer would rely solely on the project area for their habitat requirements. Ferruginous hawks would likely occur closer to meadows outside of the developed zone. Flammulated owls and blue grouse are known to occur in denser mixed conifer forest on the North Rim, but generally outside of the Bright Angel peninsula. Mountain lions and bighorn sheep may travel through the project area, but it does not provide key habitat for these species because it is within the developed area of the North Rim on the Bright Angel peninsula, and existing use by visitors and employees in this area is moderate to high during peak season.

Breeding Birds. The Arizona Working Group of Partners in Flight developed a Bird Conservation Plan (Latta et al. 1999) as part of a national effort to address the concern for the future of migratory and resident birds. The Conservation Plan lists priority bird species by habitat type and identifies management actions that will benefit those species. The project areas are in ponderosa pine and the Conservation Plan identifies four priority species in this habitat type: northern goshawk, olive-sided flycatcher, cordilleran flycatcher and purple martin. Combined, these priority species, as well as species associated with them, use the entire range of structural levels represented in ponderosa pine from grasses to the top of the canopy. The goshawk is also considered a special status species and will be discussed below. Management recommendations for habitat for the olive-sided flycatcher include maintaining or creating tall snags for perches and applying presettlement restoration treatments. Recommendations for the cordilleran flycatcher include maintaining dense canopy closure in mid- to late-successional stages with an oak understory and dead and down trees for nesting. Recommendations for purple martin include creating snags and promoting the longevity of large snags, use prescribed fire and mechanical thinning to reduce tree densities and manage for openings in the forest canopy. Arizona Partners in Flight recommends using fire as a management tool to create desired forest conditions and reduce fuel load as an efficient method for all four bird species. Recommendations for forest management that would benefit breeding birds came out of a study by Rosenstock (1996) that included a study site in Grand Canyon National Park. Recommendations pertinent to this project include retention of snags, Gambel oaks, and large old ponderosa pine, particularly those equal to or greater than 24 inches diameter at breast height (dbh).

Special Status Species. Table 4 includes a list of threatened, endangered, proposed, and species of concern on the North Rim of Grand Canyon National Park., based on known occurrences or habitat preferences. In-depth discussion of federally listed species issues in the analysis area is the subject of a separate Biological Assessment (BA). Of the ten federally listed wildlife and plant species that are known to occur or are likely to occur in Grand Canyon National Park, three occur on or near the North Rim. There are no confirmed nest or roost locations for special status species in the project area..

The list in Table 4 was developed from personal knowledge of the area by park biologists, park records, the AGFD Heritage Nongame Data Management System database (2000), and Arizona Game and Fish Department and U.S. Fish and Wildlife Service biologists.

A detailed analysis of the expected effects of this project on Threatened and Endangered species is the subject of a separate Biological Assessment (NPS 2002). A brief description of the special status species applicable to this project is included in Appendix D.

The greater western mastiff bat and spotted bat are known to occur on the North Rim. Both species roost in cliffs and are insectivorous. Recent studies in northern Arizona are focusing on Greater Western mastiff bats and have been documenting roosts and foraging areas in the Grand Canyon. There are, however, no documented roost sites or key foraging areas within the general vicinity of project locations, although foraging is likely to occur in the open meadows north of the developed zone. An increasing number of studies are focusing on spotted bats and are slowly improving our understanding on this species (including recent surveys on neighboring Kaibab National Forest), although population abundance and densities are still poorly known. Spotted bats have recently been documented roosting in cliff faces in Grand Canyon, and have been documented foraging on the north and south rims of the park. Spotted bats forage in meadows. There are no documented roosting or foraging sites within the general vicinity of the proposed project locations, although foraging is likely to occur in the open meadows north of the developed zone. The proposed project and past, present, or foreseeable future actions would not affect

Table 4. Special Status Species of the North Rim, Based on Known Occurrences or Habitat Preferences.

Species	Scientific Name	Status	Project Vicinity Occurrence
Mexican Spotted Owl	*Strix occidentalis lucida*	T, WC	Portions of project within 0.5 miles of occupied PAC and portions of project within restricted MSO habitat
California Condor	*Gymnogyps californicus*	T*, WC	No nest sites known in vicinity, but condors observed regularly on North Rim.
American Peregrine Falcon	*Falco peregrinus anatum*	WC, SC	Nearest known eyrie is approximately 2 miles south of project area; foraging potential in developed areas is low
Northern Goshawk	*Accipiter gentiles*	WC, SC	Nearest goshawk territory boundary is approximately 1 mile northwest of project area; nesting and foraging habitat potential in project vicinity
Kaibab Squirrel	*Sciurus aberti kaibabensis*	NNL	Yes; known to occur throughout North Rim developed areas; project area within NNL designated habitat
Greater Western Mastiff Bat	*Eumops perotis californicus*	WC, SC	No known roosts nearby; foraging and roosting potential unlikely in North Rim developed areas
Spotted Bat	*Euderma maculatum*	SC	No known roosts nearby; foraging and roosting potential unlikely in North Rim developed areas

Key:
T = federally listed as threatened under the Endangered Species Act (ESA); WC = Wildlife species of special concern in Arizona (AZ Game and Fish Department 10/14/96); SC = former species of concern to the US Fish and Wildlife Service, but for which there is no legal status (all former C2 species Fed Reg. 2/28/96); T = federally listed as an experimental non-essential population in Arizona, but in National Parks the species is considered federally listed as threatened under ESA; NNL = population on Kaibab plateau is considered a National Natural Landmark with direction to federal agencies to consider the unique properties of Natural Landmarks when assessing effects of actions on environment; PAC = Mexican spotted owl protected activity center.*

roosting or foraging habitat or prey populations for these species. Therefore, these species were not considered further in this document.

Environmental Consequences

Methodology

The baseline information used to assess impacts to wildlife and special status species is as described in the methodology section at the beginning of this chapter and includes park staff knowledge of the resources and site; review of existing literature and park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Additional sources of information on wildlife used as a basis for this evaluation are as described above in the affected environment section.

The thresholds of change for the intensity of an impact on wildlife populations are defined as follows:

Negligible – a change to a population or individuals of a species or to designated critical habitat that is not measurable or perceptible.

Minor –a measurable, small, localized change to a population or individuals of a species or to designated critical habitat. The change is of little consequence.

Moderate – a change to a population or individuals of a species or to designated critical habitat. The change is measurable, localized, and of consequence.

Major – a measurable and large and/or widespread change to a population or individuals of a species or to designated critical habitat.

Alternative A - No Action

Direct/Indirect Impacts The no action alternative would maintain the project area in its current state and would continue to provide habitat in the project area for many wildlife species, although habitat quality in the immediate area would remain relatively low due to the existing level of development and human activity. Without a change in vegetation or human use in the project area, wildlife populations would generally remain the same. Selection of the no action alternative would not affect TES species in the project vicinity, or their habitat, beyond the on-going impacts of visitation and human activity that have been occurring in this area for many years. The continued use of the building would not impact any sensitive wildlife habitat requirements such as nesting and/or roosting sites, key foraging areas, key calving or fawning areas, or primary wildlife travel corridors. Selection of the no action alternative would therefore have no impact on the species of interest or species of concern listed above. However, it should be noted that the existing water system is considered inadequate to properly protect all of the resources on the North Rim, including historic structures, or to adequately control a fire that might occur on the Bright Angel peninsula under drought conditions. This inadequacy in the fire protection system, particularly in light of the existing drought conditions on the North Rim, has the potential to result in adverse impacts to natural and cultural resources, including vegetation and wildlife habitat.

Mexican Spotted Owl: Ongoing activities at the North Rim create daily disturbance from mid-May to mid-October. Fewer people visit the North Rim during the remainder of the year, when park facilities are closed and snow often obstructs the road. This disturbance has decreased the quality of habitat in and around the North Rim developed area for MSO and would continue under the No-Action Alternative. These local, adverse, long-term impacts are negligible because no roosting or nesting habitat is present on the North Rim and the amount foraging habitat affected is negligible compared to the amount of available habitat. No vegetation manipulation or construction activities are proposed under Alternative A, and no new sources of disturbance would be introduced. Alternative A would therefore have no additional effects on MSO.

California Condor: Existing developments at the North Rim create year-round human presence in the vicinity. Human presence creates the possibility for condor/human interactions. Condors are monitored daily via radio telemetry, and any condors that land in the developed area at the North Rim would be hazed by permitted Park employees to ensure condors do not become habituated to humans. Current Park policies and activities would be continued under Alternative A, and adverse impacts to condors would be negligible, long-term, and local. No vegetation manipulation or construction activities are proposed under Alternative A. No California condor habitat would be impacted, and no new sources of disturbance would be introduced with this alternative. Therefore, the No-Action Alternative would have no additional effects on California condors.

Northern Goshawk: Existing developments on and near the Bright Angel Peninsula have resulted in the removal or modification of potential nesting and foraging habitat for the northern goshawk. Human activity at the North Rim, particularly on the Bright Angel Peninsula from mid-May to mid-October, also reduces the suitability of the area for nesting and foraging by goshawks. Existing development and human activity could have adverse, local, long-term, minor impacts on northern goshawks. No additional habitat would be modified under the No-Action Alternative, and this alternative would not have any additional effects on northern goshawks.

Peregrine Falcon: The construction of existing developments on and near the Bright Angel Peninsula has affected potential habitat for peregrine prey. This local, adverse, long-term impact is negligible because the amount of habitat affected is negligible compared the amount of available habitat. Noise from year-round activities at the North Rim is unlikely to affect peregrines because no eyries are known from within 0.5 mile of the developments. Therefore, impacts of the continuation of current Park policies on peregrine falcons would be adverse, negligible, local, and long-term. No construction would take place under Alternative A, and this alternative would have no additional effects on peregrine falcons.

Kaibab Squirrel: Existing developments on the Bright Angel Peninsula have resulted in the removal or modification of approximately 93 acres of ponderosa pine habitat. Although ponderosa pine habitat is widespread on the North Rim and the Kaibab Plateau, the developed area on the Bright Angel Peninsula contains the only ponderosa pine habitat in the Bright Angel Peninsula subwatershed. This loss of habitat thus constitutes a minor to moderate, local, adverse, long-term effect to Kaibab squirrels and the National Natural Landmark. No additional habitat would be modified under the No-Action Alternative, and this alternative would not have any additional effects on Kaibab squirrels.

Effects Common to All Action Alternatives

Direct/Indirect Impacts: Loss of habitat for proposed activities within the campground and the trenching required for the water system improvements would likely have negligible, adverse, local, short- and long-term effects on wildlife populations. A direct loss of some individuals could occur during construction activities. However, the majority of small mammals, birds, and reptiles that are currently utilizing the habitat that is proposed for trenching or for campground restrooms would be displaced to adjacent habitat. Vegetation disturbance could result in a loss of foraging habitat and cover for deer, turkey, voles/shrews, and breeding birds, but this likelihood is considered remote due to the small size of the disturbed areas and the fact that the work would be conducted in the existing developed area of the North Rim. Tree removal for trenching for the waterline replacement would result in disturbance through a large area but is considered minor due to the fact that tree removal would be minimal and staggered along the corridor and that the disturbed area would not be developed and would remain natural habitat following the burying of the waterpiping. Therefore, the action alternatives may impact individuals of Species of Interest, but, because of the small size of the project area and the implementation of mitigation measures, are not likely to result in a trend toward federal listing or loss of population viability for these species.

In addition to loss of habitat, impacts of implementing the action alternatives would include decreased wildlife security, increased disturbance to adjacent habitat, and increased fragmentation. However, these adverse, long-term, local impacts would be negligible because they would occur in areas currently degraded because of high disturbance levels from existing developments, roads, utility corridors, and human use.

Because the existing water system is considered inadequate to properly protect all of the resources on the North Rim or to adequately control a fire that might occur on the Bright Angel peninsula under drought conditions, improvements in the water system has the potential to result in beneficial impacts natural resources, including vegetation and wildlife habitat.

Mexican Spotted Owl: No vegetation manipulation would occur below the rim and no activities related to increasing visitor use of the area below the rim are proposed. Therefore, the action alternatives would not result in any impacts to nesting or roosting habitat. One exception to this is a small portion of the water distribution system improvements that would occur near the water tanks. This area has been classified as MSO restricted habitat. Surveys have occurred in this area and no MSO have been located. Foraging habitat that would be affected is of marginal quality because of high disturbance levels from existing developments, roads, and human use. In addition, relative to the amount of available foraging habitat, the amount lost would be negligible. The loss of foraging habitat could result in a limited amount of prey base mortality. Woodrats, mice, and voles could be killed during construction activities. However, the majority of prey utilizing the habitat proposed for removal would be displaced to adjacent habitat and not killed. In addition, the change in prey base would be negligible because only a small area would be affected relative to available habitat for prey species. Spotted owls are unlikely to be affected by noise associated with construction activities because the nearest known PAC is more than 0.8 km (0.5 mile) from the most of the project areas. The exception to this is that portion of the water distribution system at the very southern end of the employee dining room (EDR) area and south to the lodge. This portion of the project is within 0.5 miles of the Transept Canyon PAC and construction activities in this area would need to be restricted during the MSO breeding season. Therefore, any action alternative would have a negligible, local, long-term, adverse impact to MSO.

California Condor: The action alternatives would not result in any impacts to nesting or roosting habitat for the California condor because all such habitat occurs below the rim. No vegetation manipulation would occur below the rim, and no activities related to increasing visitor use of the area below the rim are proposed. Foraging habitat would not be affected because these alternatives would not change the availability of food sources for condors. The action alternatives could affect California condors through increased contact with humans during construction. Condors may be attracted by construction activities, and condor contact with humans would be of concern if the birds are harassed or become habituated to humans. Mitigation measures to cease construction activities if condors are present would reduce disturbance from construction activities on the birds. Hazing by permitted Park employees would ensure condors do not become habituated to humans. Because all activities proposed under the action alternatives would occur in areas of the North Rim that are already developed, use of the facilities hould not have any long-term effects on the potential for interactions between condors and humans. Therefore, adverse impacts to condors would be short-term, local, and negligible.

Northern Goshawk*:* All action alternatives would result in the removal or modification of approximately 3 acres of potential goshawk nesting and foraging habitat. The habitat that would be modified is of low quality because existing development has fragmented the habitat and resulted in human disturbance in the area throughout the goshawk breeding season. Noise disturbance as a result of construction activities could result, but would be negligible because these facilities are in an area that currently receives daily human disturbance during the breeding season. Therefore, the effects of any of the action alternatives would be adverse, local, negligible, and both long- and short-term.

Peregrine falcon: No peregrines are known to nest within 0.5 mile of the project area, and no direct effects on peregrine falcons are expected under any of the action alternatives. The action alternatives would remove or modify approximately 3 acres of potential habitat for peregrine falcon prey. However, this loss of habitat would be unlikely to affect peregrine falcons because the change in prey base would be negligible given the small area being affected relative to the available potential habitat for the prey base. The majority of the prey base utilizing the habitat proposed for removal would be displaced to adjacent habitat. Indirect adverse effects on peregrine falcons under any action alternative would be negligible, long-term, and local.

Cumulative Impacts: As described in the vegetation section of this Chapter, modification of habitat in the Bright Angel watershed subunit has occurred as a result of past and present activities and modification would result from implementation of future projects. In addition to the approximately 234 acres of habitat that have been impacted by existing development, modification of an additional 19 acres would occur as the result of foreseeable future development and construction-related projects in the North Rim developed area (Figure 2, Figure 4, Appendix G). All of these future projects would occur within the developed area of the North Rim and would be in, or in close proximity to, previously disturbed and developed areas. Up to approximately 120 - 150 large (greater than 12 inches DBH) ponderosa pine trees may need to be removed as a result of implementation of foreseeable future projects. Cumulative impacts would include decreased wildlife security, disturbance to adjacent habitat, and fragmentation in the North Rim developed area. These local, short- and long-term, adverse impacts would be minor because of the widespread availability of montane conifer habitat in the vicinity within the Bright Angel peninsula subwatershed.

Cumulative impacts to vegetation as they relate to past and future fires and prescribed burns is as described above under Vegetation. Because of the widespread availability of montane conifer habitat within the Bright Angel watershed subunit and the fact that most of this is essentially undisturbed, cumulative impacts from implementation of past and future actions, combined with past, present and future actions would be adverse, but minor and both short- and long-term.

Mexican Spotted Owl: Ongoing activities at the North Rim create year-round disturbance in the vicinity. Past and present development has affected potential foraging habitat for MSO in the Bright Angel Peninsula sub-unit. This habitat alteration is unlikely to affect spotted owls because MSO are not known to use areas on the plateau. The Outlet Fire affected potential foraging habitat within the Bright Angel Peninsula subwatershed. The intensity of the fire varied, and the rate of vegetation recovery within the fire perimeter also varies. Because burned areas will recover, the effect of the fire is not considered a net loss of habitat. Prescribed fires are unlikely to affect MSO because none of these prescribed burn areas are in habitat known to be used by spotted owls, and low-intensity fires are not known to affect spotted owl presence or reproduction (Jenness 2000). No future activities are planned within the Park that would modify spotted owl critical habitat. Foreseeable future developments in the vicinity of the North Rim could modify potential foraging habitat and result in increased disturbance during construction. However, this additional modification of foraging habitat is unlikely to affect the spotted owl because foraging habitat in affected areas is of marginal quality as the result of the high level of existing development, roads, and human use. Any disturbances to MSO from noise associated with construction activities for this project or any foreseeable future projects would be minimized by mitigation measures such as those specified earlier in this document. The cumulative effects of any action alternative, in combination with other past, present, and reasonably foreseeable future actions, on spotted

owls in the Bright Angel Peninsula sub-unit would be negligible to minor, adverse, local, and long-term.

California Condor: Ongoing activities at the North Rim create year-round disturbance in the vicinity and provide the potential for condor/human interactions. Foreseeable future developments at the North Rim would be primarily contained to existing developed areas and would not increase the long-term likelihood of condor/human interactions. Construction activities associated with the action alternatives and any future developments may attract condors. Mitigation measures, such as those included in this document, would reduce the potential for detrimental interactions between condors and humans for any of the action alternatives as well as any foreseeable future actions. The cumulative effects of any action alternative, in combination with other past, present, and reasonably foreseeable future actions, on condors would be negligible, short- and long-term, local, and adverse.

Northern Goshawk: Past and present development has altered goshawk nesting and foraging habitat in the Bright Angel Peninsula sub-unit and has created year-round human disturbance in the area. The area affected is minor compared to the amount of available montane conifer habitat in the vicinity. The Outlet Fire affected potential foraging and nesting habitat within the Bright Angel Peninsula subwatershed. The intensity of the fire varied, and the rate of vegetation recovery within the fire perimeter also varies. Because burned areas will recover, the effect of the fire is not considered a net loss of habitat. Burned areas also support prey species of the goshawk such as woodpeckers. Prescribed burning has been conducted within the watershed sub-unit since 1997 and is planned for additional areas in the next 5 years. Low-intensity burns are recommended in ponderosa pine and mixed conifer vegetation types to provide habitat for prey species and to reduce the incidence of catastrophic fire (Reynolds et al. 1992). Prescribed burns, therefore, may have minor, local, beneficial effects on northern goshawks. Foreseeable future developments in the vicinity of the North Rim could modify approximately 16 acres of potential foraging habitat and result in increased noise disturbance during construction. This additional modification of habitat is unlikely to affect the northern goshawk because habitat in affected areas is of marginal quality as the result of the high level of existing development, roads, and human use. The cumulative effects of any action alternative, in combination with other past, present, and reasonably foreseeable future actions, on northern goshawks in the Bright Angel Peninsula sub-unit would be minor, adverse, local, and short- and long-term.

Peregrine Falcon: The Outlet Fire affected approximately potential habitat for peregrine prey within the Bright Angel Peninsula subwatershed. The intensity of the fire varied, and the rate of vegetation recovery within the fire perimeter also varies. Because burned areas support potential peregrine prey and because these areas will recover, the effect of the fire is not considered a net loss of habitat. Prescribed burning has been conducted within the watershed sub-unit since 1997 and is planned in the next 5 years. Prescribed fires are generally of small size and low intensity and would not be expected to have measurable effects on the availability of peregrine prey species. In addition to the potential peregrine foraging habitat that has been affected by past development, 16 acres of potential foraging habitat would be affected at the North Rim by foreseeable future developments. None of the foreseeable future developments would affect nesting habitat below the rim or increase use of the area below the rim. The majority of the developments would occur in existing disturbed areas and would not measurably change prey base populations. Cumulative adverse impacts of any action alternative, in combination with past, present, and reasonably foreseeable future actions, would therefore be negligible, local, and long-term.

Kaibab Squirrel: The cumulative impact area for Kaibab squirrels was defined as ponderosa pine areas within the Bright Angel Peninsula subwatershed. In addition to the 93 acres of ponderosa pine habitat that have been affected by past and present developments at the North Rim, approximately 35-55 ponderosa pine > 12 inches dbh could be removed by foreseeable future actions on approximately 4.0 acres. Any foreseeable future actions would occur in close proximity to previously disturbed areas. Cumulative effects of any action alternative, along with other past, present, or reasonably foreseeable future actions on Kaibab squirrels would be minor to moderate, adverse, long-term, and local.

Impairment: Direct, indirect, and cumulative impacts to the wildlife resource would be negligible as a result of implementing the no action alternative. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's wildlife resources or park values.

Alternative B

Direct/Indirect Effects: Alternative B would result in the loss of approximately 30-35 ponderosa pine trees for the new campground entrance, half of which are large trees, greater than 18 inches in diameter at breast height (DBH). Combining this tree removal with that estimated for the campground restroom construction and the water distribution system improvements would result in the removal of approximately 41 – 58 primarily ponderosa pine trees. This level of tree removal is substantial when compared to tree removal estimates for Alternative C, and even when compared to estimates of tree removals for future projects. This modification of habitat for wildlife is greater than that proposed for Alternative C and has a higher potential than Alternative C of impacting wildlife populations that may be using the area. However, these adverse, long-term, local impacts would be minor because they would occur in areas currently degraded because of high disturbance levels from existing developments, roads, utility corridors, and human use.

Kaibab Squirrel: This alternative would result in the removal of 30 – 35 ponderosa pine trees > 12 inches dbh that could provide foraging, nesting, and sheltering sites at the campground. Construction activities could result in direct mortality of individuals but are more likely to cause displacement of Kaibab squirrels to adjacent habitat. Because the area that would be disturbed is in an area already disturbed by existing developments and activities, Alternative B would have minor, local, long-term, adverse effects on Kaibab squirrels.

Alternative C – Preferred Alternative

Direct/Indirect Effects. Alternative C would result in less ground disturbed than Alternative B, since Alternative C does not include the construction of a new campground entrance road. Alternative C would result in the loss of approximately 3-5 ponderosa pine trees for the new campground registration building. Combining this tree removal with that estimated for the campground restroom construction and the water distribution system improvements would result in the removal of approximately 14 – 28 primarily ponderosa pine trees. This modification of wildlife habitat is substantially less than that estimated for Alternative B and has less potential Than Alternative B of impacting wildlife populations that may be using the area. Alternative C would result in negligible long- and short-term, local, adverse impacts to wildlife populations.

Kaibab Squirrel: This alternative would result in the removal of 14 - 28 ponderosa pine trees > 12 inches dbh that could provide foraging, nesting, and sheltering sites for Kaibab squirrels at the campground. Construction activities could result in direct mortality of individuals but are more likely to cause displacement of Kaibab squirrels to adjacent habitat. Fewer trees would be removed under this alternative than under Alternative B, but impacts to Kaibab squirrels could still result. However, the area that would be disturbed is in an area already disturbed by existing development and activity. Alternative C would have negligible, local, long-term, adverse effects on Kaibab squirrels.

Section 7 Consultation: A detailed analysis of the expected effects of this project on Threatened and Endangered species is the subject of a separate Biological Assessment (NPS 2002). The potential for adverse impacts to federally listed species from implementation of the campground rehabilitation and the majority of the water distribution system improvements, as identified in the preferred alternative, has been consulted on with the U.S. Fish and Wildlife Service (USFWS). USFWS concurred with the park's determination that implementation of this project, along with many other construction projects in the park over the next five years, may affect, but is not likely to adversely affect, the Mexican spotted owl or the California condor or their habitat. Peregrine falcons were also discussed in this document (USFWS letter July 9, 2002). A brief description of the special status species applicable to this project is included in Appendix D. A small portion of the water distribution system improvements that would occur near the water tanks site is the subject of a separate Biological Assessment and consultation with FWS for this small aspect of the project is on-going.

Conclusions: The No Action alternative would not result in changes to general wildlife populations or special status species. Alternative B would result in minor short-term impacts to general wildlife populations during construction and negligible to minor adverse long-term impacts to special status species. Alternative C would result in minor short-term impacts to general wildlife populations during construction and negligible to minor adverse long-term impacts to special status species. Cumulative long-term adverse impacts would be minor to moderate for general wildlife populations, negligible to minor for MSO, minor for condor, negligible for peregrine falcon, minor for goshawk and minor to moderate for Kaibab squirrel. For purposes of Section 7 under the Endangered Species Act, Alternatives B and C may affect, but are not likely to adversely affect MSO and condor. FWS concurrence has been received on these determinations (July 9, 2002) but consultation on a small section of waterline near the water tanks is currently in progress.

CULTURAL RESOURCES

Affected Environment

Archeological Resources

Although the North Rim has some of the most important archeological sites in Grand Canyon National Park, especially in the Walhalla Glades area where surveys have located hundreds of sites (NPS 2001g:21), there are only three known archeological sites on the Bright Angel Peninsula (Euler 1975, NPS 2001). Archeological surveys conducted on the peninsula over the last 20 years have not identified any additional sites (NPS 2001g). None of the three sites is located in the action alternative project areas.

The settlement history for the area reflects considerable occupation during AD 1050 to AD 1150, when intensive farming occurred during the summer for approximately 100 years. Native

American use of the North Rim and surrounding area is known in general terms, both from ethnographic accounts and from on-going consultation with the eight affiliated tribes of Grand Canyon. No specific references have been identified for the Bright Angel Peninsula area. There is a cultural landscape report being conducted on the North Rim, and the results will be reviewed and incorporated into the planning process before implementation of this project.

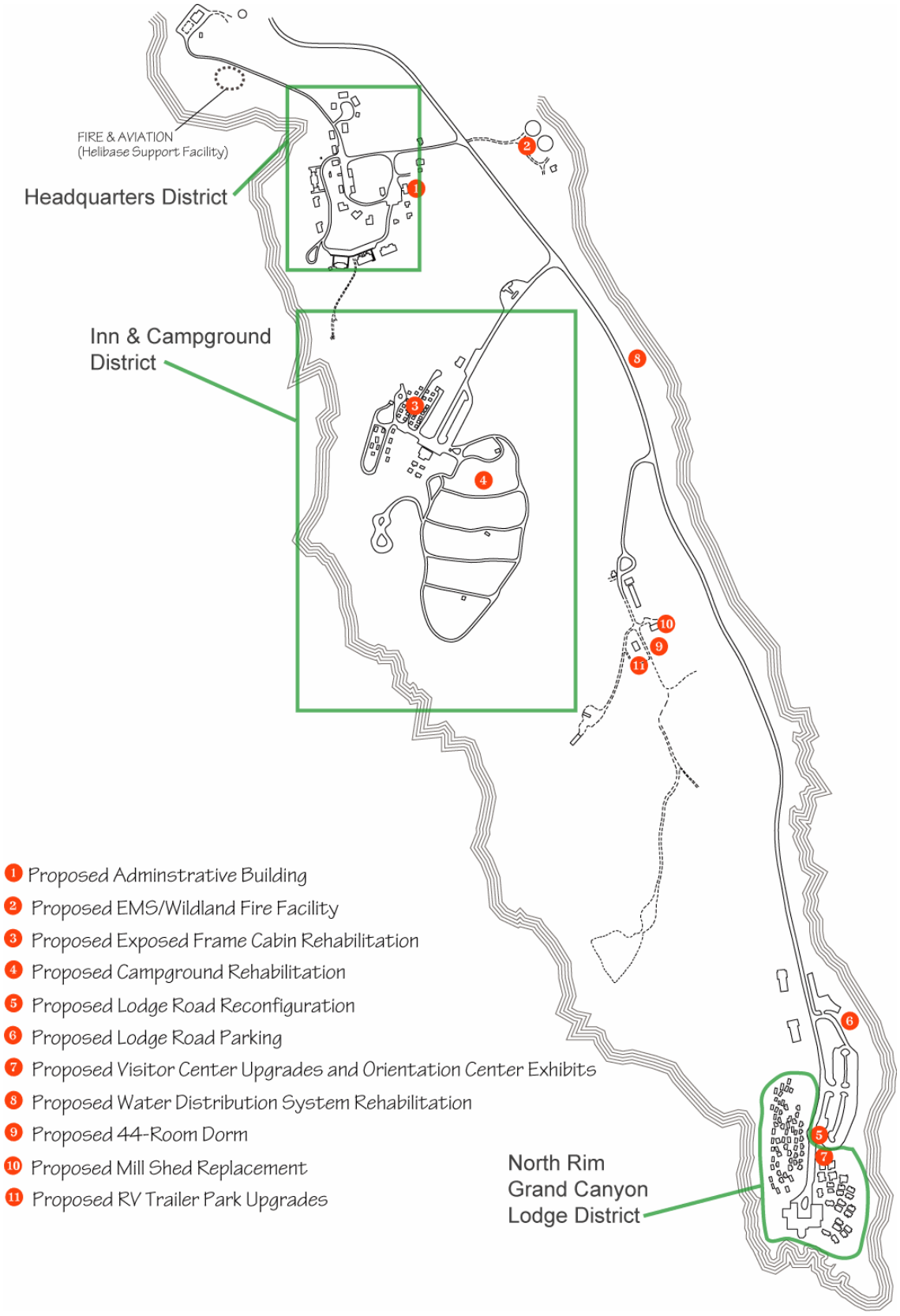
Historic Resources

Three historic districts on the North Rim are listed on the National Register of Historic Places (Figure 11). These include the Grand Canyon Inn (North Rim Inn) and Campground Historic District, the Grand Canyon North Rim Headquarters District, and the Grand Canyon Lodge Historic District, also designated as a national historical landmark. Of the three districts, only the North Rim Inn and Campground Historic District and the North Rim Headquarters Historic District could potentially be affected by project undertakings. The Grand Canyon Lodge Historic District is south of all action alternatives and would not be affected by the proposed development. Therefore, the following discussion does not include the Grand Canyon Lodge Historic District. The North Rim Inn and Campground Historic District was listed on the National Register of Historic Places in 1982 (Chappell 1982a). The district includes the North Rim Inn; 26 exposed frame cabins, 10 duplex log cabins; a linen house; a shower/bath building; a laundry building; and the campground with its outdoor fireplaces, stone enclosures for firewood, restrooms and shower facilities, and amphitheater for interpretive programs. The North Rim Headquarters Historic District was listed on the National Register of Historic Places in 1982 (Chappell 1982b). The headquarters area consists of two groupings of buildings. The easternmost grouping consists of several residences, a garage, and an administrative building. The westernmost grouping includes maintenance buildings, an administrative building, a barn, and more residences. Most of the buildings were constructed in the late 1920s and early 1930s (Chappell 1982b).

The comfort stations (restrooms) within the campground have been the recent focus of a Determination of Eligibility for National Register listing. It was recommended by NPS that the two restroom of the Mission 66 Era do not exhibit sufficient architectural features or historic significance to merit listing on the National Register of Historic Places (NPS 2001b) and should not be considered eligible for listing. This recommendation was submitted to the Arizona State Historic Preservation Officer (SHPO) for their review and concurrence, and they concurred that the Mission 66 era restrooms in the park, including those in North Rim Campground, are not eligible for listing on the National Register of Historic Places (AZ State Historic Preservation Office letter 3/13/01 and 4/23/01). However, SHPO is of the opinion that these structures are potentially eligible for listing on the National Register once they reach 50 years old and recommend that the Secretary of the Interior's Standards for the Treatment of Historic Properties (Weeks 1995) be used to guide rehabilitation efforts at this time.

The term "Mission 66" refers to a 10-year design and construction initiative intended to improve park visitor services and infrastructure between 1956 and 1966. The Mission 66 era structures and buildings reflect a standardized design that was employed by numerous parks in the system including Grand Canyon. True to the Mission 66 style, restrooms within the North Rim campground feature a minimum of architectural detailing, emphasizing modern architectural style of the time, such as flat roofs and low horizontal lines. Reflecting the relatively modest budgets of the time, these restrooms are constructed of inexpensive materials and are unobtrusive (NPS letter 4/01).

Figure 11. Historic Districts on the North Rim, Grand Canyon National Park.



Cultural Landscape Resources
The *Cultural Landscapes Inventory Professional Procedures Guide* prepared by the NPS defines cultural landscapes as: . "settings that human beings have created in the natural world. They reveal fundamental ties between people and land—ties based on our need to grow food, give form to our settlements, meet requirements for recreation, and find suitable places to bury our dead. Cultural landscapes are intertwined patterns of things both natural and constructed—plants and fences, watercourses, and buildings. They range from formal gardens to cattle ranches, from cemeteries and pilgrimage routes to village squares. They are special places—expressions of human manipulation and adaptation of the land" (Page 2001:1).

A Cultural Landscape Report (CLR) is currently being prepared for the North Rim Bright Angel Peninsula Developed Area (OCULUS 2002). The purposes of the CLR are to identify, document, analyze, and evaluate contributing and non-contributing cultural landscape characteristics within the cultural landscape, and to provide specific recommendations and comprehensive vision for the landscape that can guide long-term management. Once completed, the CLR will serve as a supporting document for implementation of the GMP. The CLR specifically addresses the Bright Angel Peninsula Entrance Road Corridor, which continues its original linear organization. "One of the main attractions of the road was its close proximity to the canyon edge; an alignment that continues today (IV-35)." OCULUS also discusses the campground area, pointing out that the spatial patterns and relationships of the original developed cluster remain intact (IV-36).

Ethnographic Resources
Ethnographic resources are defined by the NPS as any "site, structure, object, landscape, or natural resource feature assigned traditional, legendary, subsistence, or other significance in the cultural system of a group traditionally associated with it" (Cultural Resource Management Guidelines [DO-28:191]). The lands of Grand Canyon National Park are traditionally affiliated with nine American Indian groups: Havasupai, Hopi, Hualapai, Kaibab Band of Paiute Indians, Navajo, Paiute Indian Tribe of Utah, White Mountain Apache, San Juan Southern Paiute, and Pueblo of Zuni.

The Grand Canyon has long been of importance to native cultures and figures prominently in the origin/religious beliefs and ceremonial practices of many groups. For example, traditional Hopi and Zuni beliefs hold the Grand Canyon as the sacred place from which their ancestors emerged to the present world (NPS 2001f). Although ethnographic resources significant to Native Americans may be present in the vicinity of Bright Angel Peninsula, no ethnographic resources are known to exist within the area proposed for development (NPS 2001g). Copies of this EA will be forwarded to each affiliated tribe for review and comment. If the tribes subsequently identify the presence of additional ethnographic resources within the project construction area, appropriate mitigation measures would be undertaken in consultation with the tribes. The location of any ethnographic sites would not be made public.

Environmental Consequences

Methodology
The baseline information used to assess impacts to cultural resources is as described in the methodology section at the beginning of this chapter and includes park staff knowledge of the resources and site; review of existing literature and park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Additional

sources of information on cultural resources used as a basis for this evaluation are as described above in the affected environment section.

Archaeological Resources. The definitions for levels of impacts to archaeological resources are as follows:

Negligible impact is barely measurable and has no perceptible consequences, either adverse or beneficial, to archaeological resources. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor Adverse – disturbance of the site(s) is confined to a small area with little, if any, loss of important information. For purposes of Section 106, the determination of effect would be *no adverse effect*.
Beneficial – a site is preserved in its natural state. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate Adverse – disturbance of the site(s) results in a substantial loss of important information. For purposes of Section 106, the determination of effect would be *adverse effect*.
Beneficial – Stabilization of the site(s). For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major Adverse – disturbance of the site(s) is substantial and results in the loss of most or all of the site and its potential to yield important information. For purposes of Section 106, the determination of effect would be *adverse effect*.
Beneficial – active intervention is undertaken to preserve the site. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Historic Resources. The definitions for levels of impacts to historic structures or buildings are as follows:

Negligible impact is barely measurable and has no perceptible consequences, either adverse or beneficial, to historic structures. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor Adverse – the character-defining feature(s) of a structure listed on or eligible for the National Register are not affected. For purposes of Section 106, the determination of effect would be *no adverse effect*.
Beneficial – stabilization/preservation of the character-defining feature(s) in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* to maintain the existing integrity of a structure. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate Adverse – the character-defining feature(s) of the structure are altered but the integrity of the resource is not affected to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.
Beneficial – rehabilitation of a structure in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* to make possible a compatible use of the property while preserving its character-defining features. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major Adverse – the character-defining feature(s) of the structure are altered and the integrity of the resource is affected to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.
Beneficial – restoration in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* to accurately depict the form, features, and character of a structure as it appeared during its period of significance. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Cultural Landscapes. The definitions for levels of impacts to cultural landscapes are as follows:

Negligible impact is barely measurable and has no perceptible consequences, either adverse or beneficial, to cultural landscapes. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor Adverse – the character-defining feature(s) of a cultural landscape listed on or eligible for the National Register is/are not affected. For purposes of Section 106, the determination of effect would be *no adverse effect*.
Beneficial – character-defining features are preserved in accordance with the Secretary of the Interior's standards to maintain existing integrity of the cultural landscape. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate Adverse – the character-defining feature(s) of the cultural landscape is/are altered but the integrity of the resource is not affected to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.
Beneficial – a landscape or its features are rehabilitated in accordance with the Secretary of the Interior's standards to make possible a compatible use of the landscape while preserving its character-defining features. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major Adverse – the character-defining feature(s) of the cultural landscape is/are altered and the integrity of the resource is affected to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.
Beneficial – a landscape or its features are restored in accordance with the Secretary of the Interior's standards to accurately depict the landscape as it appeared during its period of significance. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Alternative A – No Action
Direct/Indirect: The No Action Alternative would have no direct effect on identified cultural resources on the North Rim. The cultural landscape, including the historic buildings and structures of the North Rim Inn and Campground Historic District and the North Rim Headquarters Historic District would be protected to the greatest extent possible under existing NPS policies and the availability of Park staff and other support personnel to carry out maintenance. Any archeological and ethnographic resources that may be present in the area would be preserved and protected in situ under this alternative. However, the no-action

alternative has the potential to affect landscape features at the North Rim indirectly. Specifically, failure to maintain restrooms and repair campground roads would exacerbate the rate of deterioration of historic features and may threaten their character-defining abilities. However, it should be noted that the existing water system is considered inadequate to properly protect all of the resources on the North Rim, including historic structures, or to adequately control a fire that might occur on the Bright Angel peninsula under drought conditions. This inadequacy in the fire protection system, particularly in light of the existing drought conditions on the North Rim, has the potential to result in adverse impacts to natural and cultural resources, including vegetation and wildlife habitat. For these reasons, implementation of Alternative A would result in negligible to minor adverse impacts to cultural resources.

Cumulative: The historic districts and the overall cultural landscape of the Bright Angel Peninsula have sustained previous impacts as the result of modifications to some historic buildings. Modern buildings have also intruded on the historic setting of the cultural landscape. Furthermore, previous deterioration of some buildings as a result of natural weathering and use has compromised defining architectural characteristics. Past development of Park facilities has likely impacted archaeological resources in the area. Loss or disturbance of archaeological sites on the North Rim (in conjunction with previous losses and prevailing threats to finite numbers of archaeological resources throughout the region) incrementally diminishes the overall understanding of Grand Canyon's cultural history. These past impacts are moderate, adverse, local, and long-term. Most of the foreseeable future projects that have the potential to affect cultural resources have been discussed with SHPO. Consultation with SHPO and using the treatment recommendations made in the CLR (Oculus 2002) as the basis for future projects would ensure that any adverse effects of future projects on cultural resources would be negligible to minor. Therefore, adverse cumulative effects would be moderate, local, and long-term. Under the action alternatives, beneficial cumulative effects would be moderate, long-term, and site-specific.

Impairment: Direct, indirect, and cumulative impacts to cultural resources would be negligible to moderate as a result of implementing the no action alternative. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's cultural resources or park values.

Section 106 Summary

After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, *Assessment of Adverse Effects*), the National Park Service concludes that implementation of Alternative A would result in a "no historic properties affected" determination.

Alternative B

Direct/Indirect Impacts: Because no ethnographic resources or archeological sites have not been located in the project area, impacts to these resources would be negligible from implementation of Alternative B. Adherence to mitigation measures designed for archeological resources should further minimize the potential for adverse impacts. Because Alternative B would result in more ground disturbance than Alternative C, Alternative B has a higher potential of disturbing undiscovered archeological sites, but this likelihood is still minimal. Trenching in previously disturbed areas would be required for both Alternatives B and C to implement the improvements to the water distribution system. Monitoring by a cultural resource specialist during trenching would be conducted to ensure trenching actions would not disturb archeological resources. This,

in addition to other standard mitigation measures, as described in Chapter 2, would minimize the likelihood of adverse impacts to cultural resources from implementation of Alternative B.

Because the existing water system is considered inadequate to properly protect all of the resources on the North Rim, including historic structures, or to adequately control a fire that might occur on the Bright Angel peninsula under drought conditions, improvements in the water system has the potential to result in beneficial impacts to cultural resources. Replacement of existing fire hydrants and installation of four new hydrants in historic districts has the potential to adversely impact the districts. The colors chosen and the exact placement of the hydrants should be done in consultation with park cultural resource staff to ensure adverse impacts are minimized, and is a mitigation measure common to both action alternatives (page 26).

Reconfiguration of the campground entrance road would constitute a minor but adverse, long-term effect on the historic district and historic cultural landscape. According to the CLR currently being developed (OCULUS 2002), the Bright Angel Peninsula Entrance Road Corridor currently continues its original linear organization. One of the main attractions of the road was its close proximity to the canyon edge. This alignment continues today. The spatial pattern is considered a key element of the peninsula's historic character (Section IV, pages 34 & 35 of CLR) and the proposed changes to the entrance configuration would alter the spatial pattern of this area.

Rehabilitation of Mission 66 restrooms has been addressed in consultation with the SHPO (2001). These comfort stations do not exhibit a level of significance sufficient to the exceptions of the 50 year guideline, and are currently considered to be ineligible for inclusion to the National Register. However, the implementation of mitigation measures (Chapter 2) allows for flexibility during later design development to determine the applicability of the Secretary of the Interior's Standards to the Mission 66 restroom rehabilitation.

Cumulative impacts: The historic districts and the overall cultural landscape of the Bright Angel Peninsula have sustained previous impacts as the result of modifications to some historic buildings. Modern buildings have also intruded on the historic setting of the cultural landscape. Furthermore, previous deterioration of some buildings as a result of natural weathering and use has compromised defining architectural characteristics. Past development of Park facilities has likely impacted archaeological resources in the area. Loss or disturbance of archaeological sites on the North Rim (in conjunction with previous losses and prevailing threats to finite numbers of archaeological resources throughout the region) incrementally diminishes the overall understanding of Grand Canyon's cultural history. These past impacts are moderate, adverse, local, and long-term. Most of the foreseeable future projects that have the potential to affect cultural resources have been discussed with SHPO. Consultation with SHPO and using the treatment recommendations made in the CLR (Oculus 2002) as the basis for future projects would ensure that any adverse effects of future projects on cultural resources would be negligible to minor. Therefore, adverse cumulative effects would be moderate, local, and long-term. Under Alternative B, combined with future projects designed to protect historic resources (such as installation of fire sprinklers) minor long-term beneficial effects would also result.

Impairment: Direct, indirect, and cumulative impacts to cultural resources would be minor to moderate as a result of implementing Alternative B. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National

Park Service planning documents, there would be no impairment of Grand Canyon National Park's cultural resources or park values.

Section 106 Summary

After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, *Assessment of Adverse Effects*), the National Park Service concludes that implementation of Alternative B would result in a "no adverse effect" determination.

Alternative C - Preferred

Direct/Indirect Impacts: Because no ethnographic resources or archeological sites have not been located in the project area, impacts to these resources would be negligible from implementation of Alternative C. Adherence to mitigation measures designed for archeological resources should further minimize the potential for adverse impacts. Because Alternative C would result in less ground disturbance than Alternative B, Alternative C has less potential of disturbing undiscovered archeological sites. Trenching in previously disturbed areas would be required for both Alternatives B and C to implement the improvements to the water distribution system. Monitoring by a cultural resource specialist during trenching would be conducted to ensure trenching actions would not disturb archeological resources. This, in addition to other standard mitigation measures, as described in Chapter 2, would minimize the likelihood of adverse impacts to cultural resources from implementation of Alternative C.

Because the existing water system is considered inadequate to properly protect all of the resources on the North Rim, including historic structures, or to adequately control a fire that might occur on the Bright Angel peninsula under drought conditions, improvements in the water system has the potential to result in beneficial impacts to cultural resources. Replacement of existing fire hydrants and installation of four new hydrants in historic districts has the potential to adversely impact the districts. The colors chosen and the exact placement of the hydrants should be done in consultation with park cultural resource staff to ensure adverse impacts are minimized, and is listed as a mitigation measure common to both action alternatives (page 26).

Implementation of Alternative C would not result in any changes to the campground entrance road, substantially minimizing the potential for adverse impacts to the surrounding historic district and cultural landscape. Removal of the existing non-historic kiosk and construction of a new registration building in the location proposed, which is in the historic district would require that the design of the building be carefully planned by the park's historical architect and in consultation with the SHPO. The registration building would be designed in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties and this would be distinctive yet compatible with the surrounding district.

Rehabilitation of Mission 66 restrooms has been addressed in consultation with the SHPO (2001). These comfort stations do not exhibit a level of significance sufficient to the exceptions of the 50 year guideline, and are currently considered to be ineligible for inclusion to the National Register. However, the implementation of mitigation measures (Chapter 2) allows for flexibility during later design development to determine the applicability of the Secretary of the Interior's Standards to the Mission 66 restroom rehabilitation.

Cumulative impacts: Cumulative impacts from implementation of Alternative C when combined with past and future actions would be the same as that described for Alternative B. Continued Consultation with SHPO and using the treatment recommendations made in the CLR (Oculus 2002) as the basis for future projects would ensure that any adverse effects of future projects on cultural resources would be negligible to minor. Therefore, adverse cumulative effects would be moderate, local, and long-term. Under Alternative C, combined with future projects designed to

protect historic resources (such as installation of fire sprinklers) minor long-term beneficial effects would also result.

Impairment: Direct, indirect, and cumulative impacts to cultural resources would be minor to moderate as a result of implementing Alternative C. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's soil and water resources or park values.

Section 106 Summary

After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, *Assessment of Adverse Effects*), the National Park Service concludes that implementation of Alternative C would result in a "no adverse effect" determination.

Conclusions: The No-Action Alternative would have negligible to minor, adverse, long-term, effects to cultural resources through the deterioration of campground roads and restrooms. Alternative B would result in a minor adverse impact to cultural resources through the construction of a new campground entrance road. Alternative C would have minor adverse effects to cultural resources through construction of a new registration building within the historic district. Of the action alternatives, Alternative C would have the least adverse impact on cultural resources. Future construction projects within or adjacent to Historic Districts would be developed in consultation with SHPO, NPS architects and cultural resource staff to ensure the facilities are in keeping with the Secretary's Standards, and do not intrude on the district nor diminish the district's character-defining qualities. Facilities would be designed to be distinctive but compatible with the affected district. In other words, facilities would have their own unique design that is, at the same time, appropriate and fitting for their location within or adjacent to Historic Districts. Consequently, moderate cumulative adverse impacts to historic resources from implementation of any of the alternatives would be expected.

VISITOR EXPERIENCE

Affected Environment

Approximately 10 percent of visitation to the Grand Canyon occurs at the North Rim (NPS 2002). Visitors to the North Rim encounter less traffic congestion and parking problems than visitors to the South Rim, and the North Rim provides a more leisurely pace and a more traditional park experience than the South Rim. All visitors to the Bright Angel peninsula of the North Rim pass through Jacob Lake, at the junction of Arizona 67, where the U.S. Forest Service operates a visitor contact station. Information on Grand Canyon National Park and Kaibab National Forest is available at this station. At the North Rim entrance station to the Park, each vehicle receives an official park brochure along with a copy of the North Rim edition of the park newspaper. The only other staffed interpretive facility on the North Rim is the Visitor Center, located adjacent to the Grand Canyon Lodge.

The North Rim campground currently provides 83 campsites for tents and recreational vehicles (RV), that are available mid-May through mid-October annually. A limited number of campsites are available on a first-come first-served basis after the closure, until snow closed Highway 67 into the developed area. No hook-ups are provided at the campground for RV's. The campground group site provides five large campsites for groups. Group sites are also available during the winter to skiers and hikers with the purchase of a backcountry permit. There are two campsites that are designated as accessible. However, these sites do not meet current accessibility standards and, for a campground of this size, there should be at least three additional accessible sites. Access around the campsites and to the restrooms is marginal due to gravel, rocks, and other obstacles visitors with disabilities must maneuver around. The comfort stations within the campground are inadequate. They do not meet current accessibility standards, do not shed water and snow effectively and walkways and paths are deteriorated and do not meet accessibility standards. The comfort stations are in need of repairs and upgrading. The chemical toilets at the group site are inadequate for the level of use in the summer months and do not provide adequate service to visitors during the winter.

Access to the campground is via the campground entrance road in front of the Camper Store. During the busiest times of the season, vehicles can sometimes back up in front of the Camper Store while waiting at the kiosk to pay their campground fee. While temporary changes have been implemented at the campground asking that visitors park and then walk-up to the entrance kiosk, this is not always clear to visitors and traffic congestion between the campground entrance and the Camper Store continues to occur during the busiest times of the year.

Environmental Consequences

Methodology

The baseline information used to assess impacts to visitor experience is as described in the methodology section at the beginning of this chapter and includes park staff knowledge of the resources and site; review of existing literature and park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on visitor use in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Additional sources of information on visitor experience used as a basis for this evaluation are as described above in the affected environment section.

The thresholds of change for the intensity of an impact on visitor experience are defined as follows:

Negligible – the impact is barely detectable, and/or will affect few visitors.

Minor – the impact is slight but detectable, and/or will affect some visitors.

Moderate – the impact is readily apparent and/or will affect many visitors.

Major – the impact is severely adverse or exceptionally beneficial and/or will affect the majority of visitors.

Alternative A - No Action

Direct/Indirect Impacts: Under the No-Action Alternative, existing facilities and policies would remain in place. No changes would occur to the entrance area, restrooms, campsites, roads or paths and walkways within the campground. Traffic congestion at the entrance and in front of the

Camper Store would continue during the busiest times of the year. Restrooms would continue to decline in condition and would continue to be out of compliance with current accessibility standards. Existing accessible campsites would remain below current standards and visitors utilizing and needing universally accessible sites would continue to have a degraded visitor experience due to inadequate accessibility. The chemical toilets at the group site would continue to be inadequate for the level of use during the busiest times of the year and would not provide adequate service to winter visitors. Campground roads would remain in their current condition and would not be upgraded. The substandard entrance kiosk would remain in place and would not meet the needs of employees or accommodate an increased number of computer check-ins. Therefore, continuation of existing conditions would pose long-term minor adverse impacts to visitor experience within the North Rim campground.

Impacts Common to Both Action Alternatives B and C

Direct/Indirect Impacts: Under any action alternative, the water distribution system would be improved, campground roads would be paved, restrooms would be rehabilitated and campsites would be made accessible. Construction noise and increased construction activity within the campground would impact visitors. These effects would be minimized by limiting construction activities to 8:00 am to 6:00 pm in the summer (May 1- September 30) and to 9:00 am to 5:00 pm during the rest of the year. Construction activities would not occur on Saturdays, Sundays, or holidays unless previously approved by the Park. Trenching for the waterline would need to cross the road in a few places and would require periodic lane closures. Effects on the visitor experience would be minimized by limiting traffic disruptions to 15 minutes in any one direction. Effects of construction activities on visitor experience would occur only during the construction period. Adverse impacts to visitors would be local, short-term, and minor.

Cumulative Impacts: Of the foreseeable future projects at the North Rim, construction of the administrative building, rehabilitation of the campground, and upgrades to the water distribution system would occur in 2003, concurrently with construction of the emergency services/wildland fire facility, replacement of the helibase support facility, and preservation treatments of the exposed frame cabins. Installation of fire sprinklers, closure of the landfills, and rehabilitation of the firing range would also occur during 2003, but these activities would not affect areas used by visitors. Multiple construction projects would result in visible construction activities in several areas and increased traffic from construction vehicles. None of the projects will restrict visitor movements or affect the highest use areas (lodge and rim). All construction activities would be restricted to daylight hours and would not occur on weekends or holidays unless otherwise approved by the Park. Short-term cumulative impacts to the visitor experience would be adverse, moderate, and local.

Information regarding implementation of this project and other foreseeable future projects would be shared with the public upon their entry into the park during construction periods. This may take the form of an informational brochure or flyer about the projects distributed at the gate and sent to those with reservations at park facilities, postings on the park's website, press releases, and/or other methods. The purpose of these efforts would be to minimize the potential for negative impacts to the visitor experience on the North Rim during implementation of this project and other planned projects during the same construction season.

Many of the future projects are designed to benefit the visitor experience through upgrades to existing facilities (e.g., campground, parking, and orientation exhibits) and installation of new facilities (e.g., restrooms) where needed. Therefore, long-term cumulative effects on the visitor experience would be beneficial, moderate, and local.

Alternative B

Direct/Indirect Impacts: Under Alternative B, a new campground entrance road and kiosk would be constructed. This proposal was designed to improve visitor experience at the campground by minimizing delays in check in and vehicle stacking in front of the camper store. Aside from short term minor adverse effects during the construction period, long term moderate beneficial effects to visitor experience would result from Alternative B. Improvements in the number and quality of accessible campsites and restroom rehabilitation would also result in long-term beneficial impacts to visitors at the campground.

Alternative C – Preferred Alternative
Direct/Indirect Impacts: Under Alternative C, a new campground entrance road would not be constructed, but a new registration building within the existing parking area would. This proposal was designed to improve the visitor experience at the campground by minimizing delays in check in and vehicle stacking in front of the store, while minimizing the extent of new ground disturbance, tree removal, and potential impacts to the cultural landscape. Following construction, visitors would be required to park their vehicles and walk up to the registration building for check in and for campground information. Short term impacts during the construction period would occur but would be short-term and localized, minimized by adherence to mitigation measures, as described above. Aside from short term minor adverse effects during the construction period, long term moderate beneficial effects to visitor experience would result from Alternative C. Improvements in the number and quality of accessible campsites and restroom rehabilitation would also result in long-term beneficial impacts to visitors at the campground.

Conclusions: Implementing Alternative A would generally keep visitor experience as it is currently. Implementation of Alternative B would result in a long-term moderate beneficial improvement in visitor experience by creating a new campground entrance and making improvements in restroom facilities, roads, accessibility and water system improvements. Alternative C would result in the same moderate beneficial improvements but would result in less construction-related disturbance during implementation. Short-term minor adverse impacts to visitor experience may occur during implementation of either Alternative B or C. Moderate long-term beneficial cumulative impacts are expected due to the continued implementation of other projects that are designed to improve park facilities and consolidate park functions. Moderate short-term adverse cumulative impacts are also expected from implementation of either action alternative as a result of multiple construction projects being implemented during the same season on the North Rim. Implementation of mitigation measures, as described above, would minimize this adverse impact.

PARK OPERATIONS

Affected Environment
Park operations refer to the adequacy of staffing levels and the quality and effectiveness of the park infrastructure in protecting and preserving vital resources and providing for an effective visitor experience. Infrastructure facilities include the roads that are used to provide access to and within the park (both administrative and visitor use), housing for staff required to work and live in the park, visitor orientation facilities (visitor centers, developed and interpreted sites, and other interpretive features), administrative buildings (office and workspace for park staff), management support facilities (garages, shops, storage buildings, and yards used to house and store maintenance equipment, tools, and materials), and utilities such as phones, sewer, water, and electric.

The small kiosk at the campground entrance currently functions as a registration facility and is the primary point of contact for campground users. The staff located in this building check people

into the proper site in the campground, verify pre-registration via computer access to a nationwide reservation system, direct visitors to the proper site and control access into and out of the campground. With the adoption of the computerized reservation system, some inefficiencies have been inherited that negatively impact park operations. Check-in time ranges from 2 to 15 minutes per transaction, which results in delays at the kiosk and the vehicle-stacking problem at the entrance. The kiosk is too small for the employees who are required to work in it and does not provide adequate room for necessary equipment and storage.

Park staff are responsible for maintenance of facilities within the campground and facilities associated with the water distribution system.

Environmental Consequences

Methodology

Impacts to park operations focus on (1) employee and visitor health and safety, (2) ability to protect and preserve resources, (3) staff size, whether staffing needs to be increased or decreased, (4) existing and needed facilities, (5) communication (e.g., telephones, radio, computers, etc.), and (6) appropriate utilities (sewer, electric, water). Park staff knowledge was used to evaluate the impacts of each alternative and is based on the current description of park operations presented in the Affected Environment section of this document. Definitions for levels of impacts to park operations efficiency are as follows:

Negligible – a change in operations that is not measurable or perceptible.

Minor – a change in operations that is slight and localized with few measurable consequences.

Moderate – readily apparent changes to park operations with measurable consequences.

Major – a severely adverse or exceptionally beneficial change in park operations.

Alternative A - No Action

Direct/Indirect Impacts: Under the No-Action Alternative, maintenance of current facilities and infrastructure (like the water system) would continue. Indirect impacts would include the increased maintenance required as existing campground restrooms, campground roads and waterlines and other components of the water distribution system age and deteriorate. Continuing to rely on an outdated and leaking water system would compromise the effectiveness of the fire protection system at the North Rim. Implementing Alternative A would keep the small campground entrance kiosk in its current location and would not allow for an increase in the number of computer check-in stations or additional needed storage, These impacts would be moderate, local, long-term, and adverse.

Effects Common to All Action Alternatives

Direct/Indirect Effects. Rehabilitation of the water system would enhance the Park's ability to provide adequate fire protection and potable water to developed areas of the North Rim. Rehabilitation of the campground and its restrooms would require less maintenance than the existing facilities. The new registration building under either alternative would be an improvement over the existing kiosk and would provide for more efficient park operations. Any of the action alternatives would result in moderate, long-term, local, beneficial effects on park operations.

Cumulative Impacts. All of the foreseeable future actions are designed to have long-term, beneficial impacts on park operations through upgrades to facilities such as the administrative building, housing, offices, utilities, and other infrastructure. These impacts would be local and moderate. Construction activities could have short-term, adverse impacts through disruptions in traffic patterns, utility services, and availability of office space. These impacts would be local and minor to moderate. Use of a separate construction inspector while multiple construction projects are being implemented would minimize the adverse impact to park operations during busy construction periods.

Conclusions

The No-Action alternative would result in moderate, local, long-term, adverse effects on park operations, while either of the action alternatives would have moderate, long-term, local, beneficial effects on park operations.

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Chapter 5 – Consultation with Others

Public Involvement
The NPS sent a public scoping letter, describing several North Rim project proposals, to a mailing list of approximately 300 people on 29 November 2000. An additional scoping letter describing the parkwide restroom rehabilitation proposal was sent to this same mailing list on 8 December 2000. These letters were also posted on the park's website.

Comments in response to the scoping letters were received from the following:

- National Tour Association
- U.S. Fish and Wildlife Service
- Arizona Game and Fish Department
- Five County Association of Governments
- The Zuni Heritage and Historic Preservation Office
- Anthony Veerkamp, Western Office of the National Trust for Historic Preservation
- Kaibab Band of Paiute Indians

Arizona Game and Fish Department
NPS staff met with personnel from AGFD on 13 December 2000 to discuss this project proposal and other future proposals. A list of species of concern for the North Rim was discussed at this meeting.

U.S. Fish and Wildlife Service
NPS staff met with personnel from USFWS on 13 December 2000 to discuss this project proposal and other future proposals. A list of species of concern for projects at the North Rim was discussed at this meeting. NPS staff met with USFWS several times between March and June 2002 to discuss this project proposal in conjunction with a batch consultation for several construction projects throughout the Park, including the campground rehabilitation and water distribution system improvmements. Concurrence on the batch consultation was received from USFWS on 9 July 2002 and indicated that the projects may affect but are not likely to adversely affect the Mexican spotted owl and the California condor. Consultation with USFWS regarding a small segment of the water distribution system improvements near the water tanks is currently in progress.

Tribal Groups
The NPS sent scoping letters on 29 November 2000 and 8 December 2000 to eight tribal groups. Although nine tribal groups have interests in the Park, only eight ask to be consulted on projects outside the river corridor.

State Historic Preservation Office
NPS staff met with the Arizona SHPO during a field trip to the North Rim in August 2000 to discuss multiple North Rim projects, including those discussed in this document. This project was also discussed during a quarterly coordination meeting between NPS staff and SHPO on 16 October 2002 and 20 February 2003.

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Executive Orders

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Executive Order 12898 (Environmental Justice)

Executive Order 13186 (Migratory Birds)

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DO-2 Planning Process Guidelines

DO-12 Conservation Planning, Environmental Impact Analysis and Decision Making

DO-28 Cultural Resource Management

DO-47 Sound Preservation and Noise Management

DO-65 Explosives Use and Blasting Safety

NPS-77 Natural Resources Management Guideline

DO-77-1 Wetland Protection

DO-13 Environmental Leadership (DRAFT)

US Federal Government and State Government

36 CFR 800.11

40 CFR, Part 503

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1890 Act of Congress (26 Stat. 650)

1906 Joint Resolution of Congress (34 Stat. 831)

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1964 Wilderness Act

1966 National Historic Preservation Act

1969 National Environmental Policy Act (NEPA)

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1977 Clean Water Act

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APPENDIX A

Grand Canyon General Management Plan (1995)

Excerpts Pertaining to North Rim Campground Rehabilitation and Water Distribution System Improvements

Management Objectives (Page 7 – 8)

The management objectives for Grand Canyon National Park, which are based on the park visions, set the direction for future park management. The objectives describe desired conditions to be achieved.

International Significance

- Manage the park to preserve its integrity as a world heritage site with natural and cultural resources of national and international significance.

Natural And Cultural Resources

- Preserve, protect, and interpret the park's natural and scenic resources and values, and its ecological processes.
- Preserve, manage, and interpret park cultural resources (archeological, ethnographic, architectural, and historic resources, trails, and cultural landscapes) for the benefit of present and future generations.
- Preserve, protect, and improve air quality and related values such as visibility.
- Manage visitor use, development, and support services to protect the park's resources and values.
- Preserve and protect the genetic integrity and species composition within the park, consistent with natural ecosystem processes.
- To the maximum extent possible, restore altered ecosystems to their natural conditions. In managing naturalized ecosystems, ensure the preservation of native components through the active management of nonnative components and processes.
- Manage ecosystems to preserve critical processes and linkages that ensure the preservation of rare, endemic, and specially protected (threatened/endangered) plant and animal species.
- Protect the natural quiet and solitude of the park, and mitigate or eliminate the effects of activities causing excessive or unnecessary noise in, over, or adjacent to the park.
- Preserve natural spring and stream flows and water quality. Withdraw only the minimum water necessary to meet park purposes. To the maximum extent feasible, strive to meet increases in water demand by conserving and reusing water.
- Provide opportunities for scientific study and research focused on the Grand Canyon, consistent with resource protection and park purposes.
- Inventory, monitor, and maintain data on park natural and cultural resources and values, and utilize this information in the most effective ways possible to facilitate park management decisions to better preserve the park.
- Clearly delineate and maintain the park boundary to protect park resources and values.

- Identify and evaluate all cultural properties within the park for inclusion on the National Register of Historic Places.
- Collect ethnographic data and develop ethnohistories for the Havasupai, Hopi, Hualapai, Navajo, Southern Paiute, and Zuni peoples concerning their associations with the Grand Canyon, as appropriate, in order to preserve, protect, and interpret park resources and values important to diverse American Indian cultures, including significant, sacred, and traditional use areas.

Visitor Experience

- Provide a diverse range of quality visitor experiences, as appropriate, based on the resources and values of the Grand Canyon, compatible with the protection of those resources and values.
- Provide access that is appropriate and consistent with the character and nature of each landscape unit and the desired visitor experience.
- Consistent with park purposes and the characteristics of each landscape unit, preserve and protect the maximum opportunities in every landscape unit of the park for visitors to experience the solitude, natural conditions, primitiveness, remoteness, and inspirational value of the Grand Canyon.
- Provide equal access to programs, activities, experiences, and recreational opportunities for individuals with disabilities, as appropriate and consistent with the levels of development and inherent levels of access in areas within the park.
- Provide a wide range of interpretive opportunities and information services to best assist, inform, educate, and challenge visitors.
- Educate and influence the public through positive action to preserve and protect the world they live in, including but not limited to the park.
- Provide a safe, efficient, and environmentally sensitive transportation system for visitors, employees, and residents, consistent with management zoning and resource considerations. Emphasize nonmotorized modes of transportation wherever feasible.
- Develop visitor use management strategies to enhance the visitor experience while minimizing crowding, conflicts, and resource impacts.
- Provide visitor and employee facilities and services, as necessary and appropriate, in or adjacent to areas dedicated to those uses or in appropriate disturbed areas.

Facility Design

- Consistent with its purpose, strive to make Grand Canyon National Park a model of excellence in sustainable design and management through such means as energy efficiency, conservation, compatibility with historic setting and architecture, recycling, accessibility, and the use of alternative energy sources.
- Encourage appropriate use and adaptive reuse of historic structures, while preserving historic integrity.
- Ensure that development and facilities within the park are necessary for park purposes.
- Design high-quality facilities that exemplify visual consistency and appropriateness.
- Ensure that park developments and operations do not adversely affect park resources and environments, except where absolutely necessary to provide reasonable visitor access and experiences.

North Rim Management Objectives (Pages 9 - 10)

The North Rim is considered to include all park lands north of the canyon rim from Walhalla Plateau west to Swamp Point. The following objectives for the North Rim are in addition to the overall park objectives.

Visitor Experience

- Maintain a slow pace, low-key atmosphere and historic setting on the North Rim, including the Bright Angel peninsula, allowing visitors to have an intimate involvement with the environment. Preserve the uncrowded atmosphere of limited or no development in all areas. Ensure that park roads are maintained as meandering, scenic roads that are designed for viewing the park environment at a slow speed.
- Ensure that visitors, even on the Bright Angel peninsula, are within a short distance of areas where the sights and sounds of other people create little or no intrusion on their experience.
- Provide a primitive winter experience consistent with historic winter recreational opportunities.

Access

- Emphasize the natural environment and slow pace of the visitor experience in providing all access to the North Rim, and be consistent with the characteristics of the particular destination inside the park.
- Provide opportunities for day hikes on maintained trails through the forest environment away from developed areas.

Development

- Limit all visitor, administrative, and support facilities and services, including overnight accommodations, to maintain the integrity of the desired visitor experience and historic setting.
- Maintain large undisturbed areas on the Bright Angel peninsula.

APPENDIX B

Compliance

The following laws and associated regulations provided direction for the design of project alternatives, the analysis of impacts and the formulation of mitigation/avoidance measures:

National Environmental Policy Act of 1969 (NEPA) (Title 42 U.S. Code Sections 4321 to 4370 [42 USC 4321-4370]). The purposes of NEPA include encouraging "harmony between [humans] and their environment and promote efforts which will prevent or eliminate damage to the environment. . .and stimulate the health and welfare of [humanity]". The purposes of NEPA are accomplished by evaluating the effects of federal actions. The results of these evaluations are presented to the public, federal agencies, and public officials in document format (e.g., environmental assessments and environmental impact statements) for consideration prior to taking official action or making official decisions. Implementing regulations for the NEPA are contained in Part 1500 to 1515 of Title 40 of the U.S. Code of Federal Regulations (40 CFR 1500-1515).

Clean Water Act of 1972, as amended (CWA) (33 USC 1251-1387). The purposes of the CWA are to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters". To enact this goal, the U.S. Army Corps of Engineers (Corps) has been charged with evaluating federal actions that result in potential degradation of waters of the U.S. and issuing permits for actions consistent with the CWA. The U.S. Environmental Protection Agency also has responsibility for oversight and review of permits and actions, which affect waters of the U.S. Implementing regulations describing the Corps' CWA program are contained in 33 CFR 320-330.

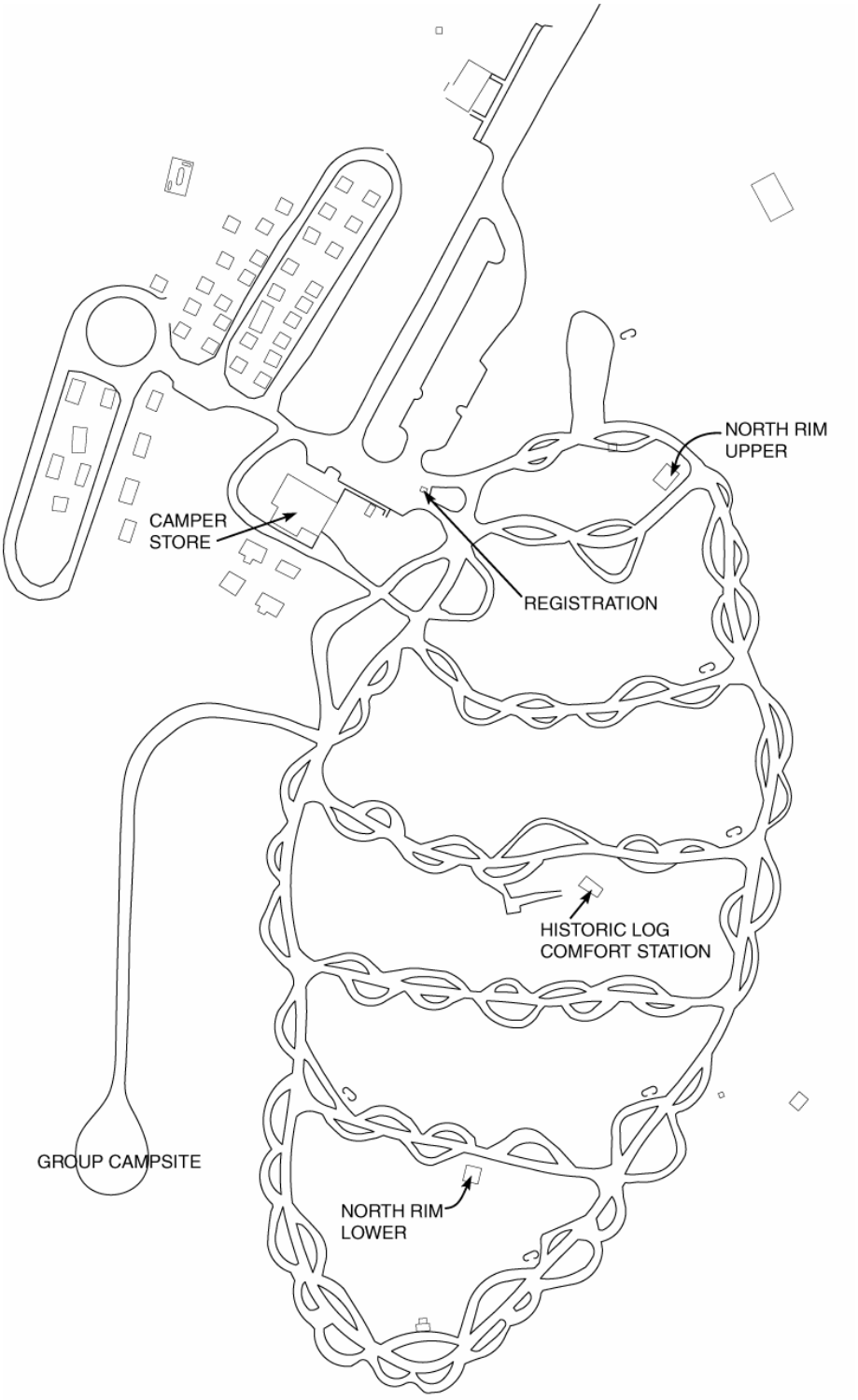
Clean Air Act (PL chapter 360, 69 Stat 322, 42 USC 7401 et seq.). The main purpose of this act is to protect and enhance the nation’s air quality to promote the public health and welfare. The act establishes specific programs that provide special protection for air resources and air quality related values associated with NPS units. The U.S. Environmental Protection Agency has been charged with implementing this Act.

Endangered Species Act of 1973, as amended (ESA) (16 USC 1531-1544). The purposes of the ESA include providing "a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved". According to the ESA, "all Federal departments and agencies shall seek to conserve endangered species and threatened species" and "[e]ach Federal agency shall. . .insure that any action authorized, funded, or carried out by such agency. . .is not likely to jeopardize the continued existence of any endangered species or threatened species". The U.S. Fish and Wildlife Service (non-marine species) and the National Marine Fisheries Service (marine species, including anadromous fish and marine mammals) administer the ESA. The effects of any agency action that may affect endangered, threatened, or proposed species must be evaluated in consultation with either the USFWS or NMFS, as appropriate. Implementing regulations which describe procedures for interagency cooperation to determine the effects of actions on endangered, threatened, or proposed species are contained in 50 CFR 402.

National Historic Preservation Act of 1966, as amended (NHPA) (16 USC 470 *et sequentia*). Congressional policy set forth in the NHPA includes preserving "the historical and cultural foundations of the Nation" and preserving irreplaceable examples important to our national heritage to maintain "cultural, educational, aesthetic, inspirational, economic, and energy benefits". The NHPA also established the National Register of Historic Places composed of "districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture". The NHPA requires that federal agencies take into account the effects of their actions on properties eligible for or included in the National Register of Historic Places and coordinate such actions with State Historic Preservation Offices (SHPO). NHPA also requires federal agencies, in consultation with the SHPO, to locate, inventory, and nominate all properties that appear to qualify for the National Register of Historic Places, including National Historic Landmarks. Further, it requires federal agencies to document those properties in the case of an adverse effect and propose alternatives to those actions, in accordance with the NEPA.

APPENDIX C1

North Rim Campground Layout and Associated Roads and Restrooms



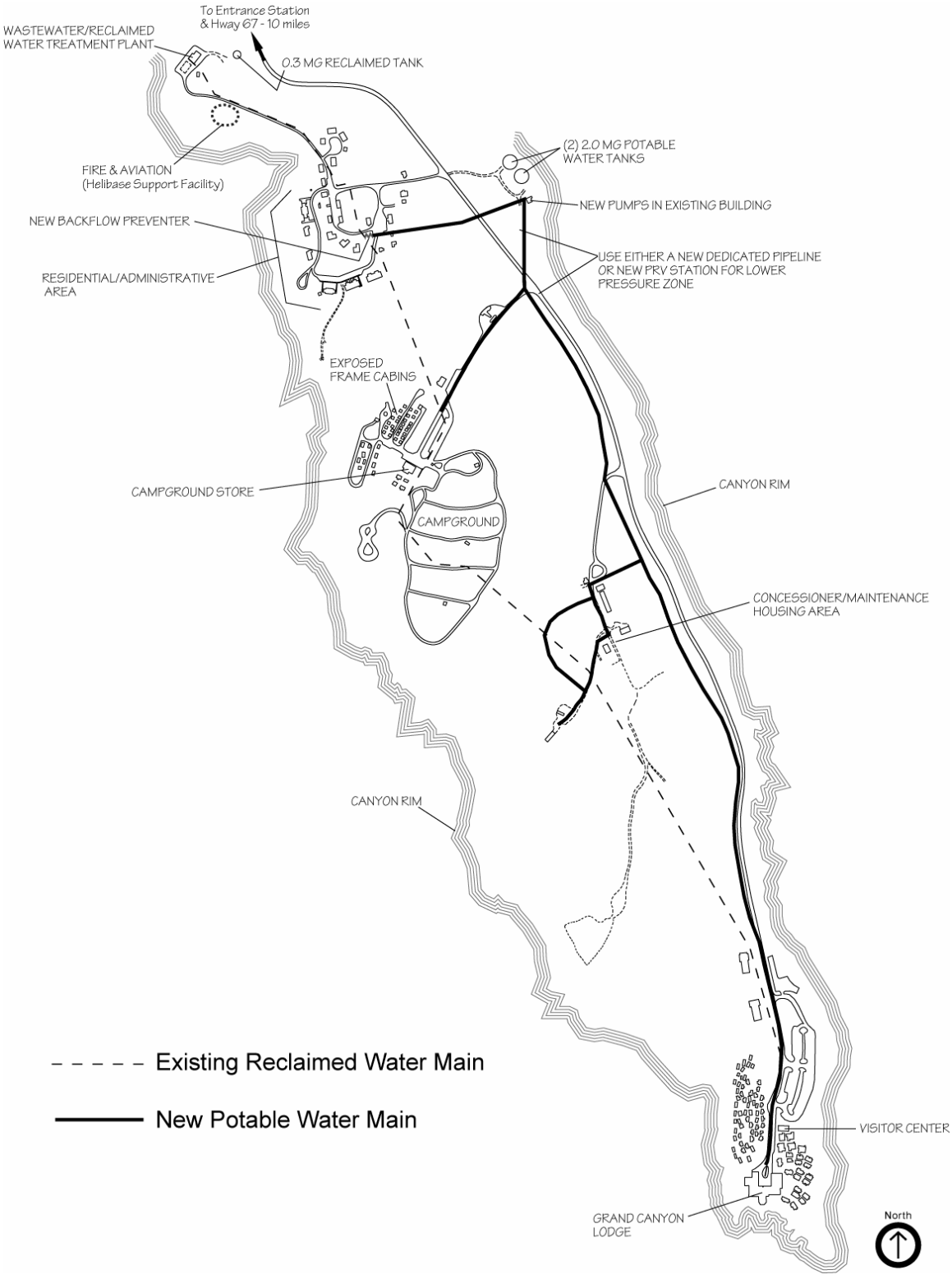
North

OVERALL SITE LAYOUT OF NORTH RIM CAMPGROUND

NO SCALE

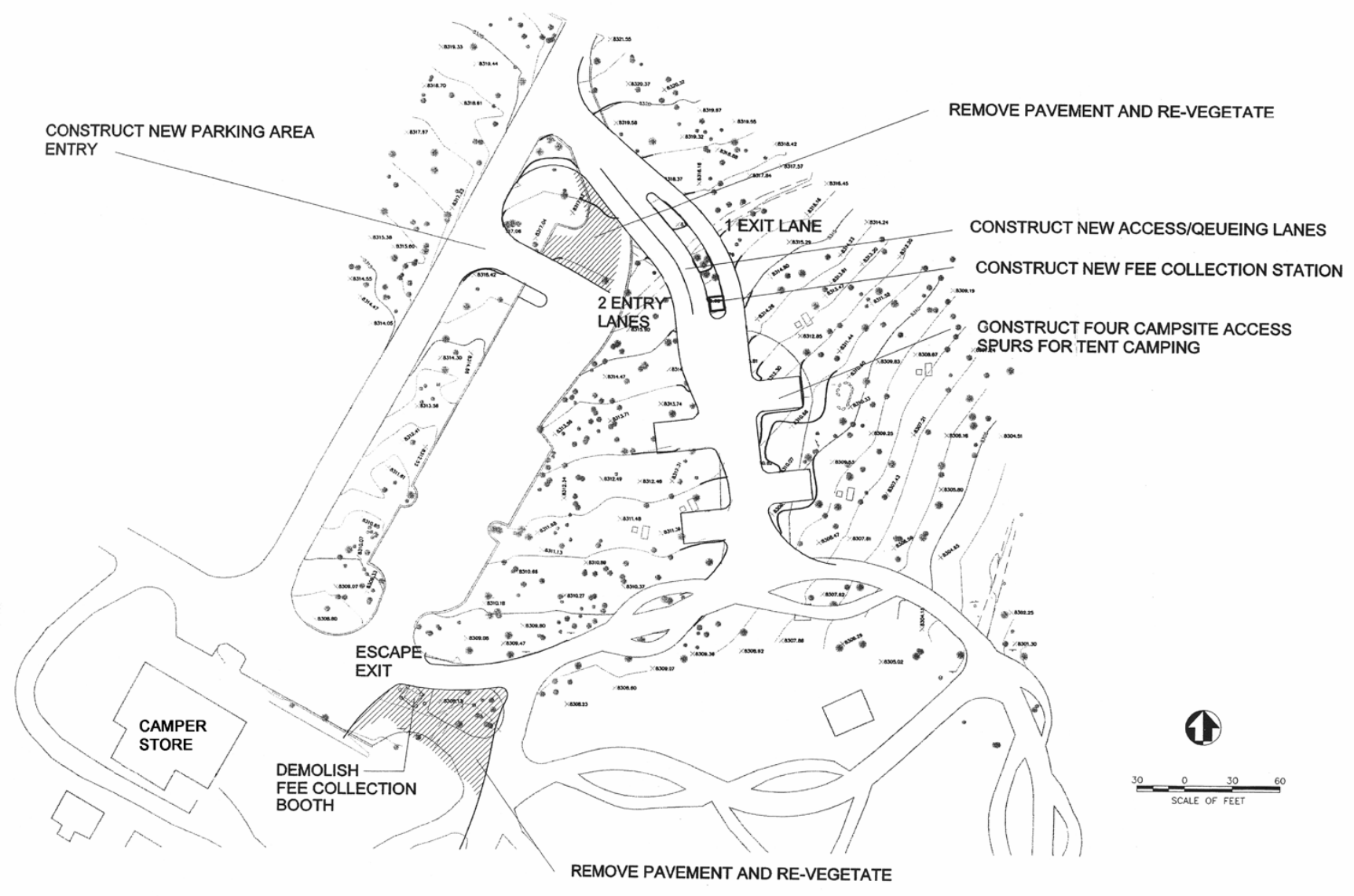
APPENDIX C2

Approximate Location of Proposed Water Distribution System Improvements (Alternatives B and C)



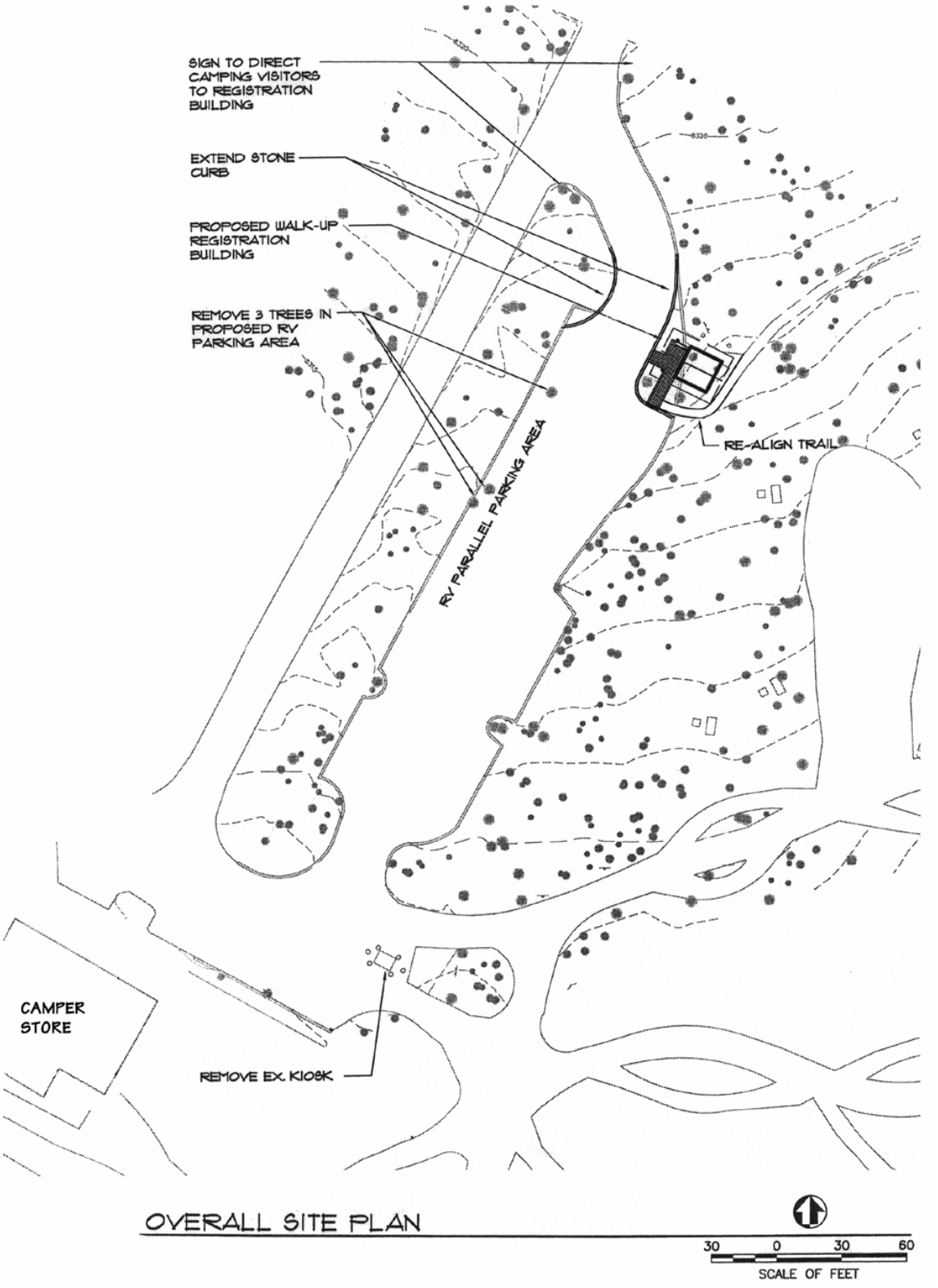
APPENDIX C3

Proposed Layout of North Rim Campground Entrance under Alternative B



APPENDIX C4

Proposed Layout of Campground Entrance under Alternative C



APPENDIX D

Wildlife Species Descriptions

Mexican Spotted Owl – Threatened - The Mexican spotted owl (MSO; *Strix occidentalis lucida*) was listed as a threatened species in March 1993, and a recovery plan was issued in 1995. MSO typically breed and roost in deep canyon or diverse forested habitats. They are associated with late seral forests and are generally found in habitat that includes mixed conifer and pine-oak forests, riparian madrean woodland, and sandstone canyonlands (USFWS 1995). However, MSO have been found in relatively open shrub and woodland vegetation communities in arid canyonland habitat (Willey 1995). Nesting habitat is typically in areas with complex forest structure or rocky canyons containing mature or old growth stands that are uneven-aged and multi-storied with high canopy closure. MSO usually nest in abandoned stick nests or in cavities in trees or cliffs. Tree nests can be on platforms such as old raptor nests or witches' brooms formed by dwarf mistletoe (*Arceuthobium* sp.) or in cavities formed by broken-off branches or tree tops. Nests in rock canyon areas are usually in cavities in the rocks or in caves (Ganey and Dick 1995).

The diet of the MSO varies depending on location and habitat. Generally it consists of small and medium-sized mammals such as peromyscid mice, voles (*Microtus* spp.), pocket gophers (*Thomomys* spp.), ground squirrels (*Spermophilus* spp.), and woodrats (*Neotoma* spp.). Woodrats are the most common and important prey item range-wide, as measured in frequency in the owls' diet and in biomass consumed (Ward and Block 1995). Other animals that may occasionally be consumed include small birds (usually Passeriformes), lizards (*Sceloporus* spp.), bats (Chiroptera), beetles (Coleoptera), and rabbits (*Sylvilagus* spp.). MSO use a wider variety of forest conditions when foraging than when nesting or roosting, and a diverse prey base is dependant on the availability and quality of diverse habitats. Spotted owls typically forage at night, although diurnal foraging has also been observed.

Data Sources: The presence of MSO within Grand Canyon National Park was confirmed in 1992 through field surveys of approximately 2,430 ha (6,000 acres) of suitable habitat on the North and South Rims. Additional MSO surveys occurred in 1994 and 1995 along the South Rim and in 1998 and 1999 along the North Rim. These surveys did not detect any spotted owls. In 1999, additional surveys were conducted in side canyon habitat along the Colorado River corridor and responses were received at six locations. Surveys continued along the river corridor in 2001, with new owls located (Willey and Ward, in prep.). An extensive owl survey was initiated in 2001 with crews surveying the inner canyon and river corridor, owl habitat below the North and South Rims, and portions of the North and South Rim plateaus. A second year of surveys for these same areas was completed in 2002. Surveys in the project area specific to Mexican spotted owls were conducted during 1998, 1999, 2001, and 2002.

Critical habitat for MSO was designated in 2001 and includes most of the Park except the South Rim. Owl habitat in Grand Canyon National Park is cool canyon habitat defined as areas with low thermal intensity, short thermal duration, and steep slopes (Spotskey and Willey 2000). Predicted habitat has been spatially defined through a geographic information system (GIS) model and may or may not include forested habitat; i.e., the coolness and short thermal duration may be a result of vertical rock faces, cliff walls, and aspect and not necessarily because an area has dense vegetative canopy cover.

The size and extent of the MSO population at Grand Canyon is currently unknown. However, survey results suggest that MSO occupy the rugged canyonland terrain within the Grand Canyon. Detections of MSO indicate they are utilizing small stringers of Douglas-fir trees below the rim (D. Spotskey, NPS, pers. com., May 23, 2000). No MSO are known from the plateau areas of the Park.

The Park falls within the Colorado Plateau Recovery Unit. The Mexican Spotted Owl Recovery Plan (USFWS 1995) provides for three levels of habitat management: protected areas, restricted areas, and other forest and woodland types. Approximately 40 MSO Provisional Protected Activity Centers (PACs) have been designated for known MSO locations in the Park as of 2002 (Spotskey pers. comm.. 9/5/02). Protected habitat in the Colorado Plateau Recovery Unit includes any PACs, designated wilderness areas, and any mixed conifer forests on slopes over 40%. Restricted habitat in the Colorado Plateau Recovery Unit includes mixed conifer forests or riparian habitats that have primary constituent elements. Primary constituent elements in these habitat types include high basal area of trees, uneven-aged structure, and high snag basal area. Primary constituent elements in canyon habitat include cooler and more humid conditions than in the surrounding area; clumps or stringers of trees; canyon walls with crevices, ledges or caves; high percent cover of ground litter or woody debris; and riparian or woody vegetation.

Spotted owls have been detected below the rim in Transept Canyon, to the west of the project area. The PAC boundary is greater than 0.5 mile from most of the project area, except those portions of the water distribution system that extend beyond the campground south to the Lodge. The campground and the majority of the waterline project are vegetated by ponderosa pine forest and do not qualify as restricted or critical MSO habitat. A portion of the waterline project, however, close to the water tanks is in habitat identified as ponderosa pine with slight fir encroachment and is considered restricted habitat.

Threats. The primary threats cited for the owl in most Recovery Units include large-scale catastrophic wildfire and timber harvest. Potential threats cited specifically for the Colorado Plateau Recovery Unit focus more on recreational impacts, road building, and overgrazing.

California Condor – Threatened – California condors ((*Gymnogyps californianus*) are large birds that reach sexual maturity by 5-6 years of age. They are strict scavengers and rely on finding their food visually, often by investigating the activity of ravens, coyotes, eagles, and other scavengers. Without the guidance of their parents, young inexperienced juveniles may also investigate human activity. As young condors learn and mature this human-directed curiosity diminishes.

The California condor was listed as an endangered species in March 1967. In 1996, the USFWS established a nonessential, experimental population of California condors in northern Arizona. In December 1996 the first condors were released in the Vermillion Cliffs area of Coconino County, Arizona, approximately 48 km (30 miles) north of Grand Canyon National Park. Subsequent releases have occurred in May 1997, November 1997, November 1998, December 1999, February 2002 and December 2002 in the same vicinity and in the Hurricane Cliff area, which is about 96 km (60 miles) west of Vermillion Cliffs. By declaring the population "nonessential, experimental", the USFWS can treat this population as "threatened" and develop regulations for management of the population that are less restrictive than mandatory prohibitions covering endangered species. This facilitates efforts to return the condor to the wild by providing increased opportunities to minimize conflict between the management of the condors and other activities. Within Grand Canyon National Park, the condor has the full protection of a threatened species (NPS 1991).

Nesting habitat for California condors includes various types of rock formations such as crevices, overhung ledges, and potholes. Most California condor foraging occurs in open meadows and throughout the forested areas of the rims. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling flights over a carcass, and hours of waiting at a roost or on the ground near a carcass. Roost sites include cliffs and tall trees, including snags (61 FR 54043-54060).

Data Sources. As of December 2002, the population of free-flying condors in Arizona totaled 33. All of the California condors in northern Arizona are fitted with radio transmitters that allow field biologists to monitor the condors' movements. Condors have been observed as far west as the Virgin Mountains near Mesquite, Nevada; south to the San Francisco Peaks outside of Flagstaff, Arizona; north to Zion and Bryce Canyon National Parks and beyond to Minersville, Utah; and east to Mesa Verde, Colorado and the Four Corners region (Peregrine Fund 2000). Monitoring data indicate condors are using habitat throughout Grand Canyon National Park, with concentration areas in Marble Canyon, Desert View to the Village on the South Rim, and the Village to Hermits Rest. During the summer/fall of 2002, the North Kaibab National Forest was used frequently for perching, roosting and foraging. Potential nesting habitat exists throughout the Park. One nesting attempt was documented in the Marble Canyon area in 2001. Two nest sites on the South Rim, one on The Battleship and one on Dana Butte, were initiated in 2002. Both nest sites failed. It is unclear whether condors would select nesting areas in close proximity to developed portions of the Park.

Threats. The main reason for the decline of condors was an unsustainable mortality rate of free-flying birds combined with a naturally low reproductive rate. Most deaths in recent years have been related to human activity. Shootings, poisonings, lead poisoning, and powerline collisions are considered the condor's major threats.

Peregrine Falcon. – **Delisted -** The American peregrine falcon (*Falco peregrinus anatum*) was listed as endangered in 1970. On 25 August 1999, the USFWS removed the peregrine falcon from the federal list of endangered and threatened wildlife due to its recovery. Peregrine falcons generally nest on cliffs near water. However, river cutbanks, trees, and manmade structures have been used as nesting habitat (USFWS 2000). Peregrine falcons feed primarily on other birds such as songbirds, shorebirds, and waterfowl. The usual method of obtaining prey is by attacking flying birds from above or chasing them from behind. Peregrines may travel up to 17 miles from nesting cliffs to hunting areas. Preferred foraging habitats include cropland, meadows, river bottoms, marshes, and lakes. Prey species may include, but are not limited to, blackbirds, jays, doves, shorebirds, and smaller songbirds.

Data Sources. The population of peregrine falcons in Arizona is steadily increasing. In 1991, the peregrine falcon population in the Rocky Mountain/Southwest region was 367 known pairs; in 1998, the number of pairs had increased to 535. In Arizona, the known number of peregrine falcon pairs was 159 in 1999 (64 FR 46542-46558). Extensive surveys have been conducted over the years in Grand Canyon National Park by park biologists and U.S. Geological Survey/BRD personnel. The Grand Canyon provides excellent cliff nesting habitat for peregrines and numerous eyries have been documented within the park. In a Draft Addendum to the Recovery Plan, the Fish and Wildlife Service recommended delisting of the southwestern regional population because the recovery goals outlined in the 1984 Plan have been met. As part of the delisting criteria, a five year monitoring plan would be established. FWS is currently in the process of establishing the monitoring areas for this plan and the eyries within the park are likely for inclusion. No peregrine eyries are known from the Bright Angel peninsula. The nearest known eyrie is within Grand Canyon more than 0.8 km (0.5 mile) from the peninsula.

Threats. The principal cause of the peregrine's decline was chlorinated pesticides, especially DDT and its metabolite DDE, which accumulated in peregrines as a result of feeding on contaminated prey. This interfered with calcium metabolism and caused a decline in reproductive success as the result of thin eggshells. Other limiting factors included availability of cliffs and prey that can limit distribution or numbers of breeding falcons, competition for nesting cliffs with other raptors, and possible predation to eggs and young.

Northern Goshawk – Species of Concern - The northern goshawk is holarctic in distribution, occupying boreal and temperate forests of North America, Europe, and Asia (63 FR 35183-35184). It is the largest of the three *Accipiter* species present in North America. There is considerable debate regarding North American subspecies of the northern goshawk. *A. g. atricapillus* is recognized worldwide as occurring over much of Alaska, Canada, and forested regions of the western and eastern United States. Two other subspecies are variously recognized: *A. g. laingi*, which occurs on islands off the Canadian Pacific Coast; and *A. g. apache*, which occurs in mountains of the southwestern United States. The USFWS does not currently recognize the *apache* subspecies (63 FR 35183-35184).

Northern goshawks generally nest in stands of mature trees with a dense canopy. In the Southwest, goshawks most frequently occupy three forest types: ponderosa pine; mixed species (primarily Douglas fir and white fir); and Englemann spruce–subalpine fir (*Abies lasiocarpa*). Nest sites are typically located on northerly slopes (Reynolds et al. 1992).

Although goshawks typically nest in stands of mature trees, they are forest generalists and use a variety of forest ages and types to meet their life history requirements (Reynolds et al. 1992, 63 FR 35183-35184). Various studies have shown that the mean size of a goshawk home range is around 5,000 acres (Reynolds et al. 1992), and these home ranges generally contain a mosaic of forest conditions. Goshawks prey opportunistically on a variety of small to mid-sized mammalian and avian species such as squirrels (Sciuridae), blue grouse (*Dendragapus obscurus*), rabbits, woodrats, doves (*Zenaida* spp.), jays (*Cyanocitta* spp.), and woodpeckers (*Picoides* spp.). Foraging habitat is probably as closely related to prey availability as to habitat structure or composition. Many prey species use snags, downed logs, woody debris, large trees, openings, and herbaceous and woody understories. Because goshawks are visually limited in habitats with dense understories, an open understory enhances detection and capture of prey (Reynolds et al. 1992).

Data Sources. Goshawk surveys have been conducted in Grand Canyon National Park. South Rim surveys were conducted regularly in 1991, 1992, and 1994-1996. Sporadic surveys also occurred in 1999 and 2000, and several nests were found. Surveys have also occurred on the North Rim, most recently in 2002 in areas affected by the Outlet Fire. The primary habitat for goshawks within the Park is in the mixed conifer and ponderosa pine habitat on the North Rim. There are approximately 10 known goshawks territories in the vicinity of the North Rim developed area, two of which are within the Bright Angel peninsula watershed. This is a small proportion of the over 100 terrritories on the North Kaibab plateau. The nearest known goshawk territory is approximately 1 mile from the project area.

Threats. There is a concern that populations and reproduction of the goshawk are declining in the western United States. These declines may be associated with forest changes caused by timber harvesting, but fire suppression, livestock grazing, drought and toxic chemicals may also be involved (Reynolds et. al 1992).

Kaibab squirrel – National Natural Landmark – Tassle-eared (Abert) squirrels (*Sciurus aberti*) are found in ponderosa pine communities in parts of Wyoming, Colorado, New Mexico, Arizona, and Utah in the United States and in the Sierra Madre Occidental from Sonora and Chihuahua south to Durango

in Mexico (Nash and Seaman 1977). Three subspecies are recognized in Arizona: *S. a. kaibabensis* (Kaibab squirrel) on the Kaibab Plateau, *S. a. chuscensis* in northeastern Arizona, and *S. a. aberti* south of the Colorado and Little Colorado Rivers. All subspecies in Arizona are restricted to ponderosa pine forests. Nests are typically built of small pine branches in a large pine tree. Nest trees are usually in closed stands and have a crown interlocked with those of several neighboring trees (Halloran and Bekoff 1994). Selected nest trees are usually one of a group of trees with interlocking crowns, are often greater than 100 years old, and between 15-20 inches in diameter.

The best habitat for Abert squirrels may be intermediate-aged forest interspersed with groups of large trees with interlocking crowns. Abert squirrels consume the seeds, inner bark, terminal buds, and staminate flowers of ponderosa pines (Nash and Seaman 1977). They also feed on fungi, mistletoe, antlers, acorns, and insects (Hoffmeister 1986). Abert squirrels are opportunistic feeders, consuming foods that are readily accessible. During the winter, the inner bark and terminal buds of ponderosa pines are the primary food source. Populations of Abert squirrels may fluctuate widely over space and time, possibly in response to variations in the seed production of pine trees (Mejia 1997). Tassel-eared squirrels are generally solitary or at least nongregarious except during the breeding season and when young are dependent on their mothers. They are diurnal and spend much of the day searching for food.

Data Sources. The Kaibab squirrel was historically found only on the North Rim of the Grand Canyon. In the 1940s, transplants of Abert squirrels occurred in mountain ranges throughout south and central Arizona. Between 1972 and 1977, Kaibab squirrels were transplanted from the Kaibab Plateau to Mt. Logan on the Arizona Strip. Kaibab squirrels now occur in the Sawmill Mountains, on Mt. Emma, and on Mt. Trumbull, in addition to the Kaibab Plateau. Kaibab squirrels on the Kaibab Plateau have been designated a National Natural Landmark. This designation comes with direction to federal agencies to consider the unique properties of Natural Landmarks when assessing effects of actions on the environment. The Bright Angel peninsula is within the National Natural Landmark boundary for the Kaibab squirrel.

Appendix E				
North Rim Exotic Plants				
Common Name	**Scientific Name**	**Family Name**	**Priority Level**	**Urgency Ranking**
Red top Grass	*Agrostis stolonifera*	Poaceae	2	High
Smooth brome	*Bromus inermis*	Poaceae	2	High
Oxeye daisy	*Chrysanthemum leucanthrum*	Asteraceae	2	High
Houndstongue	*Cynoglossum officinale*	Boraginaceae	1	High
Orchard grass	*Dactylis glomerata*	Poaceae	2	High
Dalmatian toadflax	*Linaria dalmatica*	Scrophulariaceae	2	High
Horehound	*Marrubuim vulgare*	Laminaceae	2	High
Johnson grass	*Sorghum halepense*	Poaceae	2	High
Cheatgrass	*Bromus tectorum*	Poaceae	2	Medium
Quackgrass	*Elymus repens*	Poaceae	2	Medium
Bedstraw	*Galium aparine*	Rubiaceae	2	Medium
Perennial ryegrass	*Lolium perenne*	Poaceae	2	Medium
Annual sweet clover	*Melilotus officinalis*	Fabadeae	2	Medium
Common timothy	*Phleum pratense*	Poaceae	2	Medium
Buckhorn plaintain	*Plantago lanceolata*	Plataginaceae	2	Medium
Kentucky bluegrass	*Poa pratensis*	Poaceae	2	Medium

Appendix E				
North Rim Exotic Plants				
Common Name	**Scientific Name**	**Family Name**	**Priority Level**	**Urgency Ranking**
Rabbitfoot grass	*Polypogon monspeliensis*	Poaceae	2	Medium
Sheep sorrel	*Rumex acetosella*	Polypogonaceae	2	Medium
Common dandelion	Taraxacum officinale	Asteraceae	2	Medium

APPENDIX F

Cultural Resources Documentation
North Rim Inn and Campground Historic District Nomination Form (1982)

Name: North Rim Inn and Campground

Location: North Rim, Grand Canyon National Park, Coconino Country, Arizona

Significance: "Grand Canyon Inn is of local historical significance as part of the Utah Parks Company's original developments on the North Rim of the Grand Canyon. It is of local architectural significance as an example of inexpensive "rustic" architecture intended, without highly stylized or sophisticated design or expensive materials, to replace the original tent camp with a more substantial yet still low cost tourist facility….Adjacent to this development on the south, the National Park Service established a campground with numerous campsites, whose patrons could also make use of the services offered by the main building of the Inn. The only structures in this area were also of a rustic design, and constituted of log rest rooms, stone enclosures for campfire wood, later used for trash, and an amphitheater for interpretive programs. All of the buildings and structures of "rustic" design in the Grand Canyon Inn area and the campground contribute to the significance of this historic district…"

Description: Fair condition

"The Grand Canyon Inn, also called the North Rim Inn, consisted of a main building, 27 exposed frame cabins, and ten duplex log cabins. It offered a lower proceed tourist accommodation than the more elegant Grand Canyon Lodge. Adjacent to it the National Park Service established a campground whose physical plant consisted of roads, outdoor fireplaces, stone enclosures for firewood, rest rooms and shower facilities, and an amphitheater for interpretive programs. The Inn and the campground stand in a forest of ponderosa pine and quaking aspen above the head of, but screened by the forest from view of Transept Canyon, and the Grand Canyon itself…."

"Campground structures: Adjacent to the south to the Grand Canyon Inn is the North Rim Campground, which contains some modern rest rooms and an entrance kiosk, as well as six rustic stone woodpile enclosures, now used for garbage, two log restrooms, a stone drinking fountain and an amphitheater with split log seats. The log restrooms and the stone enclosures and drinking fountain are considered to have local significance in terms of their rustic design. The amphitheater is not considered significant but it is harmonious and not an intrusion…"

[1] = *A complete copy of the National Register Nomination Form is available upon request.*

APPENDIX G

Foreseeable Future Actions on the North Rim

1. **North Rim Administrative Building –**This project would remove the existing administration building (a modular) and construct a larger building at essentially the same site, would renovate the existing parking area and continue to use the existing roads for access to the new building. The new building would be approximately 2,467 square feet and would support the backcountry permit system, visitor contact services, public restroom, and administrative offices. Very little tree removal, if any, would be required for this project, due to its location on the existing footprint of the current building and its associated parking area. The project area is relatively small, is between two residential areas and within the headquarters area where development has occurred and continues to occur. The site is in a small opening in a forest consisting mainly of ponderosa pine and some scattered aspen. Disturbance for this project is estimated at 1 acre. No trees greater than 12 inches DBH would be removed for this project.

2. **North Rim Emergency Services/Wildland Fire Facility.** A new emergency services/wildland fire facility would be built in the vicinity of the water tanks. The facility would occupy approximately 10,590 square feet and would have EMS facilities grouped at one end of the building, wildland fire facilities at the other, and shared spaces between. EMS facilities would include storage areas for emergency services vehicles (fire engine, ambulance, patrol cars, suburban), caches for EMS and search and rescue equipment, men's and women's locker rooms, holding cells, and office space. The wildland fire facilities would include storage areas for vehicles, a fire equipment cache, and office, laboratory, and work spaces. Shared facilities would include offices, a conference room, and maintenance facilities. Paved area for parking and roads would occupy approximately 0.9 acres. All utilities would be connected to the facility underground. Trenching for utilities would result in disturbance to approximately 0.14 acres. The total area of ground disturbed at the site would be approximately 2 acres and approximately 0.6 acres would be revegetated following construction. Approximately 74 trees greater than 12 inches DBH would be removed for this project.

3. **Exposed Frame Cabin Rehabilitation –** Twenty-six one-room cabins, a shower facility, and a laundry facility in the North Rim Inn and Campground Historic District would be restored, rehabilitated, or reconstructed and would be used to house the wildland fire crew. Project actions will be limited to the buildings themselves and the immediate surroundings and would not require ground disturbance or vegetation removal. No trees greater than 12 inches DBH would be removed for this project.

4. **North Rim Campground Rehabilitation –** The preferred alternative for this project includes removal of the existing entrance kiosk and constructing a new campground registration building essentially within the existing parking area, resurfacing the roads within the campground, restroom rehabilitation, installation of a 6-stall restroom and installation of one prefabricated vault toilet at the group site to replace the existing outhouse. Disturbance for this project is estimated at 0.75 acres. Approximately 4 trees greater than 12 inches DBH would be removed for this project.

5. **North Rim Lodge Road Reconfiguration –** This project would change public access routes to the Lodge. The terminus of the main road would be reconfigured to allow tour busses to

turn around and discharge and pick up guests at this terminus, and to restrict passenger vehicle access to the Lodge. The existing road segment between the parking area and the Lodge would be converted primarily to pedestrian use. Very little new ground disturbance would result from this project, as most work is confined to existing roadways and parking areas. Disturbance for this project is estimated at 0.5 acres. No trees greater than 12 inches DBH would be removed for this project.

6. **Lodge Road Parking**. The main parking area would be reconfigured to allow for additional bus/RV parking. Disturbance for this project is estimated at 0.5 acres. Approximately 13 trees greater than 12 inches DBH would be removed for this project.

7. **Visitor Center Upgrades and Orientation Center Exhibits –**Improper drainage beneath the visitor center would be repaired, the building exterior would be refinished, solar panels would be added to the roof, native vegetation landscaping would be added to the site, and repair and rehabilitation of the existing walkways around the building would be done. A wayside exhibit plan has been created by the park for the plaza area adjacent to the visitor center. Two orientation panels and three to four interpretive panels would be installed as well as a flagpole. Low-level outdoor lighting may be installed as well, but the park is still evaluating the necessity and feasibility of this component. All work would occur in areas already developed and that receive high visitor use in the summer season. No trees greater than 12 inches DBH would be removed for this project.

8. **North Rim Water Distribution System Rehabilitation –**This project involves the upgrading of the existing water distribution system, including the addition of fire hydrants and hose houses where necessary. The majority of the existing potable water lines would be dug up and replaced. A pumping station would be upgraded to boost pressure to the administrative area and the campground area. Work would be conducted in previously disturbed areas, along existing utility corridors, many of which are along roads. Tree removal would be minimal, consisting primarily of small seedlings and saplings that have grown up along the utility corridor. Approximately 2.3 miles of water line would be replaced during the course of this project. Disturbance for this project is estimated at 2.5 acres. Approximately 10 trees greater than 12 inches DBH would be removed for this project.

9. **44-Room Dorm –** A 44-unit, two-story dormitory would be constructed adjacent to the existing RV Trailer park and mill shed within the developed area of the North Rim on Bright Angel peninsula. This dorm would provide critically needed housing for concessioner employees on the North Rim. The dorm would be constructed adjacent to the RV park and in the vicinity of the concessioner dining facility and housing area. These areas are currently disturbed sites that are frequently used by concessions and park employees, and are not in areas accessed by the public. The habitat type in the project area is ponderosa pine, with some occasional aspen represented. Disturbance for this project is estimated at 2 acres. Up to Approximately 20 ponderosa pine trees greater than 12 inches DBH would be removed for this project.

10. **Mill Shed Replacement —** This is a small building that is in need of replacement. The project would take down the existing building. The current proposal would entail construction of a replacement building on the same site, pending cultural resource evaluation and consultation with the State Historic Preservation Officer. This project is located within the concessioner/maintenance and housing area, and adjacent to the site of the proposed concessioner dorm. This area is a disturbed site that is frequently used by concessions and park employees, and is not in an area accessed by the public. The habitat type in the project area is ponderosa pine, with some occasional aspen represented. Disturbance for this project

is estimated at 0.25 acres. No trees greater than 12 inches DBH would be removed for this project.

11. **RV Trailer Park Upgrades –** This project would add twelve additional RV sites to the North Rim employee trailer court and upgrade the existing infrastructure. Sites would be added within the boundaries of the existing trailer park, which is located within the concessioner/maintenance and housing area, and adjacent to the site of the proposed concessioner dorm. Vegetation disturbance would be minimal and tree removal is unlikely. This area is a disturbed site that is frequently used by concessions and park employees, and is not in an area accessed by the public. The habitat type in the project area is ponderosa pine, with some occasional aspen represented. Disturbance for this project is estimated at 2 acres.

12. **North Kaibab Trailhead Restroom –**The existing portable toilet in the upper parking area island would be replaced with a pair of prefabricated vault toilets at the same location. It is likely some rock excavation may be necessary for vault installation. Site work would include removal and replacement of curbing, accessible walkway placement and installation of accessible ramps to the toilets. No trees would need to be removed for this project. The project area is a disturbed site at the existing parking area. Disturbance for this project is estimated at 0.25 acres. No trees greater than 12 inches DBH would be removed for this project.

13. **Widforss Trailhead Restroom –** No toilet exists at this location. A single prefabricated vault toilet would be constructed at the far end of the parking area in a disturbed area. It is likely some rock excavation may be necessary for vault installation. Site work would include some grading and drainage improvements, and construction of a small drylaid stone wall behind the building. No trees would need to be removed for this project. The project area is an existing parking area. This is a small project resulting in little ground disturbance and is expected to be of short duration (2-5 days for installation). Disturbance for this project is estimated at 0.25 acres. No trees greater than 12 inches DBH would be removed for this project.

14. **North Rim Firing Range Rehabilitation –** This project entails lead abatement at the firing range. The proposal includes measures to remove lead from the site and construct a "bullet-catching" backstop that would eliminate lead contamination on the site in the future. Proposed actions would also include rehabilitation of the existing structures (firing lanes, etc.) The project area is in a quarry, is a disturbed site, and has been in use for many years as a firing range. The lead abatement portion of the project is considered heavy construction, due to the probability that some large pieces of equipment would be necessary to remove the contaminated soil and bring in new soil.. Some trees may need to removed, depending on the level of lead abatement necessary, but tree removal is not expected to be extensive and would be confined to the range and areas adjacent. Disturbance for this project is estimated at 2 acres. No trees greater than 12 inches DBH would be removed for this project.

15. **Closure of Marble Flats Landfill –** The Marble Flats landfill is an inactive sanitary landfill covering approximately 12 acres, situated in an open meadow surrounded by ponderosa pine and mixed conifer forest. This project would include capping the landfill with a 6-9 inch layer of topsoil, suitable for reclamation of the site. Because this project is reclamation of an existing disturbed site, the 12 acres of ground "disturbance" for this project was not considered modification of habitat and was not factored into the total amount of ground disturbance for all of these projects combined. No trees greater than 12 inches DBH would be removed for this project. This project was completed in late 2002, during planning for the campground rehabilitation and water distribution system improvements.

16. **Closure of Lindberg Hill Landfill -** The Lindberg Hill landfill is an inactive landfill covering approximately 5 acres. It was once used as a stone quarry before its use as a landfill and is also surrounded by forest. This project would include capping the landfill with a 6-9 inch layer of topsoil, suitable for reclamation of the site. Because this project is reclamation of an existing disturbed site, the 5 acres of ground "disturbance" for this project was not considered modification of habitat and was not factored into the total amount of ground disturbance for all of these projects combined. No trees greater than 12 inches DBH would be removed for this project. This project was completed in late 2002, during planning for the campground rehabilitation and water distribution system improvements.

17. **Arizona Trail –** This project would construct a small segment of new trail between Forest Service Land and the park boundary to connect two existing segments of the Arizona Trail. New trail construction would be limited to approximately 1.5 miles out of an approximately 11 mile segment between the park boundary and existing roads and utility corridors. Some tree removal and ground disturbance would be necessary for the 1.5 mile segment, near the entrance station. Disturbance for this project is estimated at 1 acre. Approximately 6 trees greater than 12 inches DBH would be removed for this project. This project does not occur within the Bright Angel watershed subunit. *This project does not occur within the Bright Angel watershed subunit.*

18. **North Rim Entrance Station Rehabilitation –** *This project is adjacent to but not within the Bright Angel peninsula subwatershed.* This project would rehabilitate the historic entrance station and surrounding area. A specific proposal has not yet been developed fully, but actions that are likely to be included in the project are: reconfiguration of the road and parking area, replacing the entrance sign and gate, installation of visitor orientation signs, constructing a restroom, and rehabilitating the existing historic building including upgrading the security and HVAC systems. The North Rim entrance station is located in an open meadow, although trees are within close proximity to the entrance station in some areas. Tree removal, at this early stage in project planning, is expected to be minimal. The majority of the work would be focused on the upgrading the existing development at the entrance station and would not result in substantial new ground disturbance outside of the immediate developed area. Disturbance for this project is estimated at 2 acres. Approximately 5 trees greater than 12 inches DBH would be removed for this project. This project does not occur within the Bright Angel watershed subunit.

19. **Repaving Cape Royal Road to Point Imperial Spur –** This road maintenance project would include pulverizing existing asphalt and overlaying new asphalt. Work would total approximately 6 miles of road. Widening of road will be required at some culvert locations where the road is narrower than elsewhere. Incidental improvements to guardrails and drainage will be needed. The surrounding habitat along some sections of this road is mixed conifer Much of this area was burned in the Outlet Fire. Implementation of the project may include some vegetation disturbance where slight widening is necessary near culverts. It is unlikely this would require tree removal. If tree removal is necessary, it is likely these trees would be small (seedling/sapling size) and would be adjacent to the existing road corridor. Disturbance for this project is estimated at 7 acres, approximately 5 acres of which occur within the Bright Angel watershed subunit. Approximately 5 trees greater than 12 inches DBH would be removed for this project.

20. **North Rim Development Plan –** This planning effort is addressing options for improvements in visitor orientation and interpretation for the North Rim, to implement the park's General Management Plan. This plan is still in its initial stages, and specific project components have not been identified.

21. **Prescribed Fire Future Plans –** Prescribed burning, as part of a five year prescribed burning plan, is planned for approximately 1,000 acres of the Bright Angel watershed subunit in 2004 and approximately 500 acres in 2006, for a total of 1,500 acres within the next five years.

22. **Fire Sprinkler Systems in 13 North Rim Buildings** – This project would add structural fire sprinkler systems to 13 buildings on the North Rim, equating to approximately 15,000 square feet of protected floor space. At this time, none of these buildings have sprinkler systems and need protection. Eight of the structures are listed on the National Register of Historic Places and all 13 are located within the administrative area of the North Rim developed zone. Structures to be sprinkled include 5 non-historic residences, 7 historic residences and 1 historic office building: the ranger operations office (building 119). Project actions will be limited to the buildings themselves and the immediate surroundings and would not require ground disturbance or vegetation removal. No trees greater than 12 inches DBH would be removed for this project.

23. **Computer Network Upgrading** – This project will establish a network infrastructure that will interconnect the Ranger Operations/Interp. building, the Holding Facility, the Community Building, Generator Building, Water Treatment facility, and the Heliport using wireless technology. The primary issue is the need to attach small antenna to three historical structures (Ranger Ops/Interp., Holding Facility, and Community Building). This is a small antenna, which is 6.5''long and 2.5''in diameter. Some trenching between existing buildings is also necessary to upgrade the network. Trenches would be in existing disturbed areas between buildings in the maintenance area of the North Rim. Disturbance for this project is estimated at 0.25 acres. No trees greater than 12 inches DBH would be removed for this project.

24. **Greenway Trail –** The park is exploring options for establishing a section of the Greenway Trail system in the developed area of Bright Angel peninsula on the North Rim. The Greenway trail system in the park is being designed to provide non-motorized routes of travel to lessen traffic impacts and to provide another means of traveling to visitor destinations on foot, by bicycle or wheelchair. While the planning for this trail on the North Rim is in its early stages and a proposed location for this trail segment has not yet been determined, it is thought that it would likely parallel the North Rim Entrance Road (Highway 67) and follow existing disturbed areas wherever possible to connect the North Kaibab Trailhead, Bright Angel lodge and the Transept Trail.

SUMMARY

Total estimated ground disturbance for proposed future projects:	16 acres
Total estimated ground disturbance for preferred alternative:	3.25 acres
	19.25 acres = 19 acres
Total estimated large tree removal for proposed future projects:	122 trees
Total estimated large tree removal for preferred alternative:	14 trees
	136 trees = 120 – 150 large trees